SELECTED

SESOURCESABSTRACTS



VOLUME 7, NUMBER 16 AUGUST 15, 1974 SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior



VOLUME 7, NUMBER 16 AUGUST 15, 1974

W74-08151 - W74-08700

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Resources Research U.S. Department of the Interior Washington, D. C. 20240

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Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

SELF-DIFFUSION COEFFICIENTS AND ROTA-TIONAL CORRELATION TIMES IN POLAR LIQUIDS. VI. WATER,

Argonne National Lab., Ill. D. E. O'Reilly.

Journal of Chemical Physics, Vol 60, No 4, p 1607-1618, Feb. 15, 1974. 10 fig. 2 tab, 35 ref.

Descriptors: *Water structure, *Molecular structure, *Mathematical models, *Polarity, Approximation method, Density, Ice, Diffusion, Movement, Viscosity, Particle shape, *Water properties

A new model for liquid water is presented. As a first approximation (A), the liquid is considered as a quasi-hard-sphere fluid, and the scaled particle theory is used to calculate the work (w) required to create a vacancy of molecular dimension using the observed density of water. In the second approximation (B), a quasilattice model is invoked, based on the Ice VII structure, and the density and isothermal compressibility of water are computed from w values. A final approximation (C), based on the Ice Ic structure, evaluates the temperature and pressure dependence of self-diffusion, viscosity, and nuclear relaxation times. Agreement of the model with experiment is good. Only a few parameters having physically reasonable magnitudes enter into the calculations. Results of molecular dynamics calculations on water obtained by Rahman are presented and interpreted to show that molecular rotation in water occurs in rather large excursions of relatively short durations. For times between the large angular reorientations, librational motions occur which do not result in a large net molecular reorientation. The large-amplitude reorientations are proposed to result from hard molecular collisions. These results confirm the conclusions of earlier studies on other liquids. The anisotropy of the rotational correlation time of rank 2 (tau sub 2) in an asymmetric top molecule is derived, based on the finite step rotation hypothesis. Available experimental values of 'tau sub 2' for liquid water are summarized and compared with the results of the model. (Brown-IPC) W74-08439

WATER: A COMPREHENSIVE TREATISE. VOLUME 1. PHYSICS AND PHYSICAL CHEMISTRY OF WATER.

Plenum Press, New York and London, 1972. F. Franks, editor. 596 p, 1204 ref. \$37.50. Unilever Research Laboratory, Sharnbrook, Bedford, England.

Descriptors: *Water properties, *Water chemistry, *Ice, *Steam, *Water vapor, Water supply, Water resources, Molecular structure, Thermodynamic behavior, Hydrogen bonding, Spectroscopy, Analytical techniques, Hydrodynamics, Hydraulics, *Bibliographies, *Reviews. Identifiers: Textbooks.

The 14 chapters of this volume, authored by different experts, deal with the following topics: The significance of water on earth, including its occurrence, distribution, relation to other liquids, importance to life, and the history of its scientific study. The structure of water molecules. The theory of hydrogen bonding in water, including theoretical models, dimer and polymer forms, etc. The properties of ice, such as crystallinity, phase relations, molecular and ionic transport, electroconductivity, and self-diffusion. Raman and infrared spectra. Nuclear magnetic resonance. Dielectric properties. X-ray scattering. Neutron scattering. Thermodynamic and transport properties, including thermodynamic and hydrodynamic

characteristics. Statistical mechanics. Acoustic properties, notably sound and ultrasound absorption and relaxation. Water at high temperatures and pressures. Structural models. A subject index and an extensive bibliography of pertinent references are included. (See also W74-08666 and W74-08667) (Brown-IPC) W74-08665

1B. Aqueous Solutions and Suspensions

WATEQ, A COMPUTER PROGRAM FOR CAL-CULATING CHEMICAL EQUILIBRIA OF NATURAL WATERS, Geological Survey, Menlo Park, Calif.

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 2K. W74-08606

WATER: A COMPREHENSIVE TREATISE. VOLUME 2. WATER IN CRYSTALLINE HYDRATES: AQUEOUS SOLUTIONS OF SIMPLE NONELECTROLYTES.

Plenum Press, New York and London, 1973. F. Franks, editor, 684 p. 1458 ref. \$37.50.

Descriptors: "Water properties, "Aqueous solutions, Solvents, Water of hydration, Clathrates, Hydrogen bonding, Thermodynamic behavior, Spectroscopy, High pressure, Molecular structure, "Bibliographies, "Reviews. Identifiers: Dielectrics, Mixtures, Textbooks.

Eleven chapters authored by different experts deal with following topics: The solvent properties of water. Water in stoichiometric hydrates. Clathrate hydrates. Infrared studies of hydrogen bonding in pure liquids and solutions. Thermodynamic properties of binary and ternary systems. Phase behavior of aqueous solutions at high pressures. Dielectric properties of polar liquids and aqueous mixtures. Spectral properties. Acoustic properties. Nuclear magnetic resonance spectroscopy. Molecular theories and models of water and dilute aqueous solutions. A bibliography of appropriate references is appended. Subject, compound, and formula indexes are included. (See also W74-08665 and W74-08667) (Brown-IPC) W74-08666

WATER: A COMPREHENSIVE TREATISE. VOLUME 3. AQUEOUS SOLUTIONS OF SIMPLE ELECTROLYTES.

Plenum Press, New York and London, 1973. F. Franks, editor. 472 p. 887 ref. \$37.50.

Descriptors: *Water properties, *Aqueous solutions, *Electrolytes, Hydration, Water of hydration, Thermodynamic behavior, Solvents, Equilibrium, Spectroscopy, *Bibliographies, *Reviews. Identifiers: Dielectrics, Textbooks.

The eight chapters of this volume, authorized by different experts, discuss the following topics: The thermodynamics of ion hydration and of aqueous mixed electrolytes. Hydration effects and acid-base equilibria. Ionic transport in water and mixed aqueous solvents. Infrared and raman spectroscopy of aqueous electrolytes. Nuclear magnetic resonance. Dielectric properties. Subject, compound, and formula indexes are appended, along with a pertinent bibliography. (See also W74-08663 and W74-08666) (Brown-IPC)

2. WATER CYCLE

2A. General

MODELING SNOWMELT RUNOFF IN AN ARCTIC COASTAL PLAIN,

Alaska Univ., College. Inst. of Water Resources. For primary bibliographic entry see Field 2C. W74-08233

HYDROLOGICAL EFFECTS OF URBANIZA-

For primary bibliographic entry see Field 4C. W74-08257

TRANSIENT RESPONSE OF A LAYERED, SLOPING SOIL TO NATURAL RAINFALL IN THE PRESENCE OF A SHALLOW WATER TABLE: EXPERIMENTAL RESULTS,

Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center. A. S. Rogowski, E. T. Engman, and E. L. Jacoby,

Report ARS-NE-30, February 1974. 61 p. 25 fig. 4 tab, 10 ref., 7 append.

Descriptors: *Soil water movement, *Infiltration, *Rainfall-runoff relationships, *Pennsylvania, Slopes, Structural geology, Hydrogeology, Recharge, Watersheds(Basins). Identifiers: Mahantango Creek(Penn).

Soil water flux was studied in a layered, sloping soil under natural field conditions. The study area is located on the Mahantango Creek Experimental Watershed in the ridge and valley region of east-central Pennsylvania. The area is characterized by long mountain ridges with local rehef of about 200 meters from valley floors to ridges consist of sand-stone, while interbedded shales and siltstones make up the slope and valley material. At the experimental site the angle of dip in the rock strata is about 30 degrees on both sides of the stream. The principal zones of soil water concentration lie along the abundant fracture traces. Runoff originates considerably faster in response to rainfall than either the changes in groundwater level or the changes in the soil water and the soil water pressure in the study area. Shallow well behavior in 1970 provided a response to rainfall almost as fast as the response of the stream weir in 1969. The general trend of the well and weir data is closely related to soil water content, soil water pressure, and piezometric fluctuation. Because of their fast transitory nature, the extreme peaks may well typify local response of the soil material close to the streambed or close to the shallow well. There is little change in the soil water and soil water pressure below 55 cm on Albrights silt loam. Most changes occur in the surface layer. (Knapp-USGS) W74-08375

HYDROLOGICAL ACTIVITIES IN SINGAPORE,

Singapore Dept. of Public Works. Drainage and Marine Branch. For primary bibliographic entry see Field 7C. W74-08457

TRENDS AND VARIABILITY OF YEARLY MEAN SEA LEVEL 1893-1972, National Ocean Survey. Rockville. Md.

National Ocean Survey, Rockville, Md. For primary bibliographic entry see Field 2B. W74-08643

2B. Precipitation

RAINFALL FREQUENCY ATLAS FOR MIS-SOURI, National Weather Service, Columbia, Mo.

Field 2-WATER CYCLE

Group 2B—Precipitation

For primary bibliographic entry see Field 7C. W74-08174

FOG MODIFICATION--A TECHNOLOGY ASSESSMENT.

Air Force Cambridge Research Labs., Bedford,

For primary bibliographic entry see Field 3B. W74-08177

SATELLITE VIEWS OF HURRICANE CAMILLE.

National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center. W. E. Shenk, and E. B. Rodgers.

Available from NTIS, Springfield, Va. 22151, NASA TND-7547 - Price \$4.00 printed copy. \$1.45 microfiche. Technical Note D-7547, April 1974. 80 p, 61 fig, 13 ref, append.

Descriptors: *Remote sensing, *Hurricanes, *Synoptic analysis, *Aerial photography, Meteorology, Storms, Rainfall, Floods, Climatology, Data collections, Cyclones, Weather patterns. Identifiers: *Hurricane Camille(1969).

Three periods within the life cycle of Hurricane Camille (1969) were studied with radiometric and camera measurements from Nimbus-3 satellites and camera information from ATS-3 satellites in conjunction with other information. These periods were the deepening phase, the interaction of Camille with midlatitude westerlies, and the excessive rain period when the cyclone was over the central Appalachian Mountains, Just prior to sig-nificant deepening, the Nimbus-3 Medium Resolution Infrared Radiometer (MRIR) showed that a pronounced feeder band southeast of the center was associated with the rapid transport of moisture into the storm circulation. During the rapid deepening phase the MRIR measurements indicated the development of large-scale subsidence throughout the troposphere northwest of the center. When Camille was over the lower Mississippi Valley it acted as an obstruction to the environmental wind. A region of widespread sub-sidence was created west and north of the cyclone center. Increased cloud-top elevations, back to the levels reached when Camille was an intense cyclone over the Gulf of Mexico, were estimated from the Nimbus-3 High Resolution Infrared Radiometer (HRIR) measurements on August 20, 1969, when Camille produced rains of major flood proportions near the east slopes of the Appalachians in central Virginia. (Knapp-USGS) W74-08291

AVERAGE WEEKLY RAINFALL AND PROBABILITIES DURING THE PLANTING-GROW-ING-HARVESTING PERIOD IN SOUTH CAROLINA.

National Oceanic and Atmospheric Administration, Clemson, S.C. National Weather Service. H. Landers.

Available from NTIS, Springfield, Va. 22151, COM-73-10811 - Price \$3.00 printed copy; \$1.45 microfiche. Climatic Research Series No 14, March 1973. 41 p, 34 fig. 1 ref.

Descriptors: *Precipitation(Atmospheric), *Probability, Meteorological data, Data collections, Statistics, *Rainfall, Thunderstorms, *Forecasting, *South Carolina, Meteorology, Climatology.

Weekly average values of precipitation during the growing season in South Carolina were computed for 31 weeks, from April 24 through November 26. Weekly precipitation probabilities were also computed. Weekly curves show many distinct maxima and minima, and with very few exceptions, the major ones occur at the same time all over the state. The fact that the curves relate well to each other in the last two months is related to the fact that the precipitation tends to be of a larger scale

than the scattered showers and thunderstorms common in late spring and summer. (Knapp-USGS) W74-08295

SOME FACTORS AFFECTING THE ANNUAL RAILFALL OF SINGAPORE,

Singapore Meteorological Service.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 72-83, 1972. 6 fig. 2 tab.

Descriptors: *Rainfall, *Meteorological data, *Data collections, Rain gages, Statistics, Statistical methods, Forecasting, Monsoons, Wet seasons.

Identifiers: *Singapore.

Rainfall records on Singapore Island are presented to show the relationship between the current year's annual rainfall and the following year's annual rainfall. The 10-year running mean annual rainfall are plotted to study trends in the annual rainfall for Singapore. The relationship between exceptionally heavy rain spells during the first half of the Northeast Monsoon and spells of dry weather conditions in the later half of the same monsoon season over Singapore are discussed. Although rainfall data for one or two stations on Singapore Island were available as far back as 1835, continuous rainfall records from one station from that data were not available. Two stations were selected with combined records totaling 96 years; they are sited about 13 miles apart. An exceptionally dry year, with rainfall equal to or more than 20% below average was never followed by another year which was also exceptionally dry. An exceptionally wet year, with rainfall equal to or more than 20% above average was often followed by a year with rainfall below average. There were 2 occasions in the 14 exceptionally wet years when rainfall in the following year was above average but did not reach the 20% above average mark. Severe Northeast Monsoon storms that brought spells of exceptionally heavy rain to the east coast West Malaysia, Singapore or the coastal areas of Sarawak in East Malaysia were frequently followed by dry conditions at Singapore during succeeding months. (See also W74-08454) (Knapp-W74-08459

TRENDS AND VARIABILITY OF YEARLY MEAN SEA LEVEL 1893-1972,

National Ocean Survey, Rockville, Md. S. D. Hicks, and J. E. Crosby. NOAA Technical Memorandum NOS 13, March

NOAA Technical Memorandum NOS 13, March 1974. 16 p, 9 fig, 1 tab.

Descriptors: *Sea level, *Meteorological data, *Data collections, Water levels, *United States. Identifiers: *Mean sea level, *Oceanographic data.

Sca-level trends, their standard errors, and variability are presented in tabular form for 50 locations along the coasts of the United States. The values are given for the entire series length at each station, the oldest dating from 1893 at New York. For intrastation comparisons, values are also given for the longest length of series common to 46 of the stations, 1940-72. Graphs of yearly mean sea level, upon which the calculations were performed, are plotted for 44 stations. (Sinha-OEIS) W74-08643

2C. Snow, Ice, and Frost

SURVEY OF THE SEASONAL SNOW COVER IN ALASKA

IN ALASKA, Alaska Univ., College. Geophysical Inst. B. Holmgren, C. Benson, and G. Weller. Available from NTIS, Springfield, Va. 22151 as N73-29269. Price \$3.50 printed copy; \$1.45 microfiche. ERTS-1 Project Semi-annual Report for National Aeronautics and Space Administration, July 31, 1973. 15 p, 9 fig, 3 ref, 4 append. NASA Contract NAS5-21833.

Descriptors: *Alaska, *Remote sensing, *Ice breakup, *Snowmelt, Satellites(Artificial), Snow, Ice, *Snow cover, Ice cover. Identifiers: *ERTS.

Freezeup and breakup patterns of the seasonal snow and ice covers in Alaska were studied by collection of ground-based data in a north-south transect across Alaska, and by using ERTS data together with observations from air and ground to describe the snow cover characteristics on the Arctic Slope. The ERTS data provide information on breakup patterns including development of runoff over extensive watersheds. Areas of low albedo and early snows retreat before the start of the main ablation period, and large snow drifts and aufeis remains after the main ablation period. The ERTS data can also be used to monitor manmade effects on the breakup in the Prudhoe Bay oil exploration area. (Knapp-USGS) W74-08179

MODELING SNOWMELT RUNOFF IN AN ARC-TIC COASTAL PLAIN, Alaska Univ., College. Inst. of Water Resources.

Alaska Univ., College. Inst. of Water Resources. R. F. Carlson, W. Norton, and J. McDougall. Available from the National Technical Information Service as PB-232 431 \$3.75 in paper copy, \$1.45 in microfiche. Report No IWR-43, January 1974. 72 p, 16 fig, 4 ref, 3 append. OWRR A-031-ALAS(5).

Descriptors: *Snowmelt, *Arctic, *Alaska, *Runoff, *Coastal plains, *Mathematical models, Simulation analysis, Hydrograph analysis, Heat budget, Temperature, Melt water.

Snowmelt runoff models simulate the spring runoff, an important part of the hydrologic system of Alaska's arctic coastal plain. The snowmelt model produces a snowmelt hydrograph which is converted by the runoff model into a runoff hydrograph. The snowmelt model subdivides the snow-pack into two layers. Daily climatological parameters govern the heat transfer between snowpack and atmosphere. Once the heat flux received or emitted by the snowpack has been computed, the melting processes within the snowpack are considered. Computed parameters of the snowpack are density, depth, water equivalent, water content, temperature, and thermal quality. The runoff model uses a three-parameter linear storage model to transform the snowmelt hydrograph into a runoff hydrograph. The parameters represent the amount of storage, the rate of runoff, and the lag between snowmelt and runoff. Using Prudhoe Bay weather data as input, and comparing the output to runoff data from the Kuparuk, Putuligayuk, and Sagavanirktok Rivers for the years 1970 and 1971, results indicate that the models perform satisfactorily. (Knapp-USGS) W74-08233

GROUND WATER QUALITY EFFECTS ON DOMESTIC WATER UTILIZATION, Univ. of Alaska College. Inst. of Water Resources.

For primary bibliographic entry see Field 5B. W74-08287

ACTIVATED SLUDGE DISPOSAL IN A SUB-ARCTIC ENVIRONMENT, Hill, Ingman, Chase and Co., Seattle, Wash.

Hill, Ingman, Chase and Co., Seattle, Wash. For primary bibliographic entry see Field 5E. W74-08443

APPLICATION OF ERTS-1 IMAGERY TO THE STUDY OF CARIBOU MOVEMENTS AND

Streamflow and Runoff—Group 2E

WINTER DISPERSAL IN RELATION TO PREVAILING SNOWCOVER,

Alaska Univ., College. P. C. Lent.

Available from NTIS, Springfield, Va. 22151, as N73-24376, Price \$3.00 printed copy; \$1.45 microfiche. Fifth Bi-Monthly Progress Report on ERTS Project 110-7, June 1973. 7 p.

Descriptors: *Remote sensing, *Artic, Tundra, *Snow cover, Ice satellites(Artificial), Deer, Mapping, Snowmelt. Identifiers: *ERTS, *Caribou.

Aerial reconnaissance photographs and observa-tions on snowmelt were obtained on May 21 for several selected sites within range of the caribou population. Stepwise discrimate analysis demonstrates the feasibility of feature identification using linear discriminate functions of ERTS MSS band densities and their ratios. Features such as small streams can be detected even when they are in dark mountain shadow. The potential utility of this and similar techniques appear considerable. (Knapp-USGS) W74-08602

BACTERIAL DEGRADATION OF MINERAL OILS AT LOW TEMPERATURES,

Scripps Institution of Oceanography, La Jolla,

For primary bibliographic entry see Field 5B. W74-08625

2D. Evaporation and Transpiration

CROP COOLING WITH SPRINKLERS, Department of Agriculture, Lethbridge (Alberta).

For primary bibliographic entry see Field 3F. W74-08271

EVAPORATION FROM BARE SOIL IN A

COASTAL ENVIRONMENT,
Technion--Israel Inst. of Tech.. Haifa. Lowdermild Faculty of Agricultural Engineering.

N. J. Rosenberg, I. Seginer, and I. Lomas.

In: Ecological Studies-Analysis and Synthesis, Vol 4, Hadas, A., and others, editors, Springer-Verlag, New York, 1973. p 227-236. 4 fig, 4 tab, 21 ref. OWRR A-017-NEB(6).

Descriptors: *Evaporation, *Microclimatology, *Coasts, Microen vironment, Energy budget, Humidity, Solar radiation, Deserts, Arid lands. Identifiers: *Israel.

Micrometeorological observations of energy balance components made during two days in the Spring of 1968 over irrigated bare soil on the Northern Coastal Plain of Israel indicate that air conditioned over the sea was a strong sink for sensible heat. Evapotranspiration under these climatic sible heat. Evapotranspiration under these climatic circumstances is well below the amount which the net radiation balance would permit. These data are consistent with the few available observations made in analogous coastal climatic situations. The data are also consistent with rough estimates of the fraction of net radiation consumed in evapotranspiration by well watered grass at a similar, but more southerly, site on the coastal plain of Israel Water use in many coastal areas plain of Israel. Water use in many coastal areas may be conditioned by advective influences which reduce evapotranspiration considerably below the equivalent quantity of available net radiant energy. (Knapp-USGS) W74-08305

2E. Streamflow and Runoff

WETLAND HYDROLOGY. Geological Survey, Hartford, Conn. Water resources Div. For primary bibliographic entry see Field 2L. W74-08163

LOW-FLOW CHARACTERISTICS OF KENTU-

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 7C. W74-08173

IMPROVING THE ACCURACY OF POINT-GAUGE MEASUREMENT IN HIGH-VELOCITY FLOWS (AMELIORATION DE LA PRECISION DE LA POINTE DE MESURE DANS LES ECOU-

LEMENTS RAPIDS), Indian Inst. of Tech., Madras. Hydraulic Engineering Lab. For primary bibliographic entry see Field 7B. W74-08195

THE CALIBRATION AND USE OF A CONICAL HOT FILM ANEMOMETER PROBE IN RECIR-CULATING WATER FLOW,

International Business Machines Corp., Charlotte,

Review of Scientific Instruments, Vol 45, No 3, p 368-370, March 1974. 3 fig, 5 ref.

Descriptors: Flow, *Anemometers, *Flow measurement, *Calibrations, Reviews, surement, *Instrumentation.

A calibration for directional sensitivity of a conical hot film anemometer probe is described. It is usually assumed that the conical probe is insensitive to the velocity vector direction but, in fact, this is not true because deviations of + or - 60% of the mean velocity can occur at low water speeds. In this study, the probe is aligned at right angles to the velocity vector, but the trend of the results applies to probes aligned along the velocity vector. An application of the conical probe to velocity measurements in a vortical water flow for measurements in a vortical water flow for speeds from 0.66 to 3 m/sec is discussed. (Merritt-FIRL)

FLOODFLOWS FROM SMALL DRAINAGE AREAS IN OKLAHOMA: PROGRESS REPORT

AREAS IN ORTAHOMA: PROGRESS REPORTATION, Geological Survey, Oklahoma City, Okla. W. O. Thomas, Jr., and R. K. Corley. Open-file report, 1974. 50 p, 19 fig, 8 tab, 13 ref.

*Floods, *Small *Rainfall-runoff *Small *Oklahoma, *Rainfall-runoff relationships, *Mathematical models, Calibrations, Hydrologic data, Data collections, Streamflow forecasting.

Annual peak discharges and basin and climatic characteristics are summarized for 103 small-stream sites in Oklahoma. The U.S. Geological Survey rainfall-runoff model was calibrated for six Survey rainfall-runoff model was calibrated for six small watersheds. The rainfall-runoff model can be used to extend the length of flood records for small watersheds. Records from four small watersheds were extended by the model, and watersheds were extended by the model, asynthetic frequency curves were computed for these sites to show applicability of the model. (Knapp-USGS)
W74-08292

FLOODS IN PUNALUU-HAUULA AREA, OAHU, HAWAII,

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 7C. W74-08310

MODLEING OF LAND RUNOFF EFFECTS ON DISSOLVED OXYGEN, Kansas State Univ., Manhattan. Dept. of En-

For primary bibliographic entry see Field 5B. W74-08316

THE DEVELOPMENT OF MEANDERS IN NATURAL RIVER-CHANNELS,

Simon Fraser Univ., Burnaby (British Columbia). Dept. of Geo E. J. Hickin. of Geography

American Journal of Science, Vol 274, No 4, p 414-442, April 1974. 8 fig. 3 tab, 4 plates, 20 ref.

Descriptors: *Channels, *Flood plains, Channel morphology, Channel erosion, Open channel flow, Hydraulic engineering, *Canada, *Meanders, River training. *Channel migration, *Beatton Identifiers: River(B.C.).

Investigations of the meander growth-patterns of the Beatton River in northeast British Columbia indicate that there is a critical value of the ratio radius of channel curvature to channel width (rm/w) which, once reached by a developing meander, exerts considerable control over subsequent direction and rate of lateral migration. Furthermore, the critical value of rm/w, which is reardity identifiable from the pattern of flood-plain surface deposits, appears to be much less variable in nature than is a similar parameter described by Leopold and Wolman in 1960. On the Beatton River the critical value of rm/w averages 2.11, and standard deviation is only 0.13. The pattern of meander growth is discussed in terms of the dynamics of open-channel flow. Some implica-tions of the study for river engineering and palaeohydrological investigations also are presented. (Sandoski-FIRL) W74-08357

A PROGRAMMED SAMPLER FOR RUNOFF

AND BEDLOADS, Agricultural Research Service, Lincoln, Neb. For primary bibliographic entry see Field 5A. W74-08361

SUMMARY OF PEAK STAGES DISCHARGES FOR THE FLOOD OF AUGUST 1973 IN NEW JERSEY,

Geological Survey, Trenton, N.J. S. J. Stankowski, and A. J. Velnich. Open-file report, 1974. 12 p, 2 fig, 3 tab.

Descriptors: *Floods, *New Jersey, *Peak discharge, *Historic floods, Stage-discharge relations, Water levels, Discharge(Water), Flood damage.

Intense rainfall associated with a cold front moving northeastward across New Jersey caused devastating flooding in four highly urbanized counties of north-central New Jersey on August 2, 1973. Peak-stage and peak-discharge data are given for streams in the flood-affected area. Total given for streams in the flood-affected area. 1 of the rainfall during a 5-hour period (0700 to 1200 hours EDT on August 2, 1973) averaged about 7 inches (178 mm) in a relatively narrow band across Somerset, Union, and northern Middlsex Counties. The highest total precipitation recorded was 8.78 inches (223 mm) at Bound Brook. The greatest rainfall intensity was observed in Plainfield where a total of 4 inches (102 mm) was recorded between 0715 and 0815 hours EDT on August 2, 1973. New records for stage or discharge were established at 6 continuous-record gaging stations and 6 crest-stage stations in north-central New Jersey. Flooding of unprecedented magnitude was concentrated in the highly urbanized Rahway River and Green Brook basins. (Knapp-USGS) W74-08374

MEASUREMENT OF DYE CONCENTRATIONS

BY PHOTOGRAPHY, California Univ., Berkeley. Dept. of Civil En-

gineering. P. R. B. Ward.

Journal of the Environmental Engineering Divi-sion, American Society of Civil Engineers, Vol 99, No EE3, Paper 9768, p 165-175, June 1973. 9 fig, 8 ref. append.

Field 2-WATER CYCLE

Group 2E-Streamflow and Runoff

Descriptors: *Dye releases, *Aerial photography, *Photogrammetry, Path of pollutants, Dye dispersion, Dispersion, Mixing, Instrumentation, Water measurement, Remote sensing. Identifiers: *Densitometry.

A method of measuring concentrations of solutions of dye for dispersion studies in laboratory channels uses black and white photography, followed by analysis of the photographs with a microdensitometer to determine dye concentration. The calibration curve was measured by photographing a group of bowls with solutions of known concentration. The method is reproducible and enables measurements at many points to be made with a single photograph. (Knapp-USGS) W74-08376

CLARKS FORK YELLOWSTONE RIVER REMOTE SENSING STUDY,

Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

Engineering. For primary bibliographic entry see Field 2J. W74-08386

W74-08387

FLOW CHARACTERISTICS OF SLOPING CHANNEL JUMPS,

Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.

MECHANISM FOR STREAMFLOW MEANDER-

British Columbia Univ., Vancouver. Dept. of Civil Engineering. For primary bibliographic entry see Field 8B. W74-08388

OBSERVATIONS ON HYDRAULIC JUMPS AT

ROUNDED STEP, Memorial Univ. of Newfoundland, St. Johns. Dept. of Engineering and Applied Science. For primary bibliographic entry see Field 8B. W74-08391

FLOODS IN THE VICINITY OF CRETE, NEBRASKA.

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 7C. W74-08444

FLOOD PLAIN INFORMATION; GRANTS CREEK - TOWN CREEK, CITY OF SALISBURY, NORTH CAROLINA.

Army Engineer District, Charleston. S.C. For primary bibliographic entry see Field 4A. W74-08490

FLOOD PLAIN INFORMATION; PETERS CREEK AND LICK RUN, ROANOKE, VIRGINIA.

For primary bibliographic entry see Field 4A. W74-08491

GALVESTON BAY HURRICANE SURGE STUDY: REPORT 1. EFFECTS OF PROPOSED BARRIERS ON HURRICANE SURGE HEIGHTS--APPENDIX A, CALIBRATION TESTS.

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 8B. W74-08586

FLOODS IN ALABAMA-MAGNITUDE AND FREQUENCY BASED ON DATA THROUGH SEPTEMBER 30, 1971,

Geological Survey, Tuscaloosa, Ala. C. F. Hains. Alabama Highway Department, Montgomery, 1973. 174 p, 11 fig, 6 tab, 20 ref, 3 append.

Descriptors: *Floods, *Alabama, *Flood frequency, Statistics, Equations, *Data collections, *Hydrologic data, Stage-discharge relations, Rainfall-runoff relationships.

Methods for estimating the magnitude and frequency of floods on Alabama streams are given. Data analysis includes extensions of shortterm records and the fitting of log-Pearson Type III distribution to the extended data with regional adjustments of skew, using modern computer techniques, all available streamflow records, and geographic and hydrologic information abstracted from maps. Except for streams draining urban areas, flood discharges up to 100-year recurrence can be computed for ungaged sites with drainage areas as small as I square mile. As geology or rock type is the most important variable, a geologic map is included. Records of annual maximum discharge for 209 sites in Alabama and 44 selected sites in adjacent states are included in an appendix. Tables of magnitude and frequency of floods based on station records at gaging stations and similar tables based on generalized flood equations are also included. (Knapp-USGS) W74-08587

TIME OF CONCENTRATION--A KINEMATIC WAVE APPROACH,

Metropolitan Sanitary District of Greater Chicago, Ill, Sewer Design Section.

Water and Sewage Works, Reference No 1974, p R26-R30, April 30, 1974. 2 fig, 10 ref.

Descriptors: *Time of concentration, *Hydrographs, *Overland flow, Urban hydrology, Rational formula, *Storm runoff, Rainfall-runoff relationships, *Rainfall intensity, Slope, Infiltration, Storage. Identifiers: *Kinematic wave theory.

A method is given for estimating the tir

A method is given for estimating the time of concentration as it is governed by rainfall intensity and watershed characteristics. The time of concentration (overland flow time) is affected by numerous factors such as rainfall intensity, surface slope, surface roughness, infiltration, depression, storage, and flow distance. The kinematic wave formulation provides a good approximation of the rising side of overland flow hydrograph. The solution of this equation is shown in graphical form. (Knapp-USGS) W74-08593

ESTIMATING LOW-FLOW FREQUENCY FOR PERENNIAL MISSOURI OZARKS STREAMS, Geological Survey, Rolla, Mo.

For primary bibliographic entry see Field 4A. W74-08599

HYDROGEOLOGY OF ANTIETAM CREEK BASIN.

Geological Survey, Parkville, Md. For primary bibliographic entry see Field 2F. W74-08607

TOWARDS AN OBJECTIVE ANALYSIS OF THE SEASONAL THERMOCLINE, Quebec Ministere de l'Industrie et du Commerce.

Quebec Ministere de l'Industrie et du Commerce. Service Recherche et Direction Peches Maritimes. F. R. Boudreault, and J. P. Laprise. J Fish Res Board Can. Vol 30, No 2, p 320-322,

1973. Illus. English summary. Identifiers: *Seasonal, *Thermocline, Temperature, Environmental gradient, *Thermal stratification

A definition of the seasonal thermocline, based on a generalization suggested by Riffenburgh (1970) is proposed. This allows objective analysis of the thermocline.--Copyright 1973, Biological Abstracts, Inc. W74-08691

2F. Groundwater

INLAND WETLANDS AND GROUND WATER IN EASTERN CONNECTICUT,

Connecticut Univ., Storrs. Dept. of Geology T. L. Hoizer.

In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 66-81, December 1973. 9 fig.

Descriptors: *Wetlands, *Connecticut, *Hydrogeology, Marshes, Swamps, Water table, Aquifers, Till, Glacial drift, Surface-groundwater relationships.

Climate, geology and topography determine the relationship between inland wetlands and ground-water. In eastern Connecticut, geology and topography are the most important controlling factors of the high precipitation and relative uniformity of the climate over the region. In eastern Connecticut, geology, particularly surficial geology, and topography are intimately related because of rela-tively recent glaciation. Dense crystalline bedrock theely recent igneration. Dense crystainine bedrock is overlain by a blanket of till ranging in depth from a few inches to more than 100 feet, but averaging approximately 10 to 15 feet. Thicker deposits of stratified glacial drift, consisting predominantly of sand and silt, commonly overlie the till and bedrock in major valleys. The till is weally needly corted consisting of partially range. usually poorly sorted, consisting of particles rang-ing from clay to boulders; and in some areas it is quite dense. Hence the permeability of the surfi-cial deposits tends to be lower in upland areas than in major valleys. Lowland wetlands are the result of depressions in topography which are suffi-ciently deep to intersect the water table. The upland wetlands may be more significant in terms of groundwater flow than are most valley wet-lands. Upland wetlands in many cases probably are the result of the low permeability of crystalline bedrock. The low permeability of the bedrock makes the bedrock unable to transmit the water over long horizontal distances. The upland wet-land may be functioning in the groundwater system as an overflow. (See also W74-08157) (Knapp-USGS) W74-08162

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS.

Environmental Protection Agency, Washington, D.C. Office of Air and Water Program. For primary bibliographic entry see Field 5. W74-08185

INVESTIGATIONS OF THE RESPONSE OF AN UNCONFINED AQUIFER TO LOCALIZED RECHARGE,

Maryland Univ., College Park. Dept. of Civil Engineering. P. S. Tinsley, and R. M. Ragan.

Available from the National Technical Information Service as PB-232 422 \$4.00 in paper copy, \$1.45 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No 20, (1974). 80 p. 22 fig, 8 tab, 20 ref, 2 append. OWRR B-003-Md(1).

Descriptors: *Water level fluctuations, *Numerical analysis, *Hydraulic models, Recharge, Surface-groundwater relationships, Infiltration, Capillary fringe.

Rapid groundwater responses were studied by experiments and numerical analysis. With numerical techniques, it is possible to accurately predict the behavior of an idealized unconfined aquifer under varying conditions of water table slope and local-

Groundwater—Group 2F

ized infiltration. The study was conducted by comparing the results of the finite difference solution of the Boussinesq equation to data collected from a Hele-Shaw viscous flow model. The agreement between the experimental and numerically generated water-surface profiles was quite good when the water table was mildly sloped, but this agreement became weaker as the slope was increased. The effect of capillary rise was very noticeable on the water-surface profiles under steady and unsteady conditions. Seepage surfaces were observed in the model but were ignored in the numerical solution. The experimental and numerically generated hydrographs agreed very well over the entire range of conditions studied. When subjected to localized infiltration, the water surface of the groundwater formed a mound of the same type observed in field investigations. The resulting steepening of the slope at the stream-aquifer interface produced a rapid increase in the flow into the channel which could be a quite significant portion of the storm hydrograph. (Knapp-USGS)

TWO-PHASE FLOWS IN POROUS MEDIA, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

H. J. Morel-Seytoux.

In: Advances in Hydroscience, Vol 9, Academic Press, Inc., New York, p 119-202, 1973. 56 fig, 62 ref. OWRR B-070-COLO(5).

Descriptors: *Porous media, *Flow, *Groundwater movement, *Unsaturated flow, Oil-water interfaces, Air-water interfaces, Saline water intrusion, Infiltration, Soil water movement, Percolation, Mathematical models, Hysteresis, Reviews. Identifiers: *Multiphase flow.

Water movement in the soil is a two-phase phenomenon and may not be at times adequately described or understood by the prevailing current unsaturated (one phase) approach. Many of the studies in the petroleum literature can be used effectively to solve two-phase flow problems. The understanding of simultaneous flow of immiscible fluids in a porous medium is a prerequisite to sound operations in the production of oil and of natural gas. The petroleum industry has devoted much effort to gaining a better understanding of this subject. This knowledge can be beneficially introduced to help resolve subsurface hydrology problems. The common denominator of the two disciplines (reservoir engineering and subsurface hydrology) is evident. In both areas two immiscible fluids are present: water and oil (or oil and gas) and water and air. In hydrology the mechanisms for water and air movement in the soil are primarily natural, so that fluid flow movement is caused by forces of relatively small magnitude. In petroleum production, on the contrary, fluid flow movement is often induced by considerable external pressure gradients. (Knapp-USGS)

GROUNDWATER LEVELS IN NEBRASKA, 1973.

Geological Survey, Lincoln, Nebr. For primary bibliographic entry see Field 4B. W74-08367

STOCHASTIC ANALYSIS OF GROUNDWATER LEVEL TIME SERIES IN THE WESTERN UNITED STATES.

Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
A. G. Law.

Hydrology Paper No 68, May 1974. 26 p. 19 fig, 12 tab, 15 ref. NSF Grants GR-11444 and GK-11564.

Descriptors: *Water level fluctuations, *Stochastic processes, *Groundwater, *Statistical methods, Markov processes, Infiltration, Evapotranspiration, Statistical models. The stochastic structure of monthly groundwater levels in the western United States was studied. gional variation of the time dependence was studied in the form of the stochastic components of autocorrelation coefficients for the groundwater level time series. For investigation of the stochastic structure, it was first necessary to remove the deterministic components. Upon removal of the periodic mean and periodic standard deviation, the resulting stochastic series was examined for dependence using Markov models of lag one, two and three, including the periodicity in the autocorrelation coefficients. When the dependence effects were removed, the resulting process was tested for independence. Thus the original nonstationary process is reduced to a secondorder stationary and independent stochastic com-ponent process. The final independent stochastic residuals were analyzed to find their probability distribution functions. A total of 84 wells in the 22 states west of the Mississippi River were selected for analysis. For each well the parameters neces-sary for the stochastic model were evaluated. Most wells could be described by a first-, second-, or third-order Markov model, but for 29 wells higher-order dependence models were indicated. Analysis of the regional variation of the first au-tocorrelation coefficient in the stationary stochastic component shows a much greater de pendence in monthly groundwater level series than in either monthly precipitation or streamflow time series. The second and third autocorrelation coefficients of groundwater series also displayed high values. The mean third autocorrelation coefficient for the groundwater series is greater than the mean first autocorrelation coefficient for the streamflow series. The regional correlation coefficients between the pairs of stochastic components of groundwater level time series depend on the distance between wells. However, the absolute values oscillate widely, probably due in large part to sampling errors. (Knapp-USGS) W74-08368

GROUND-WATER RESOURCES OF DUVAL COUNTY, TEXAS, Geological Survey, Austin, Tex.

Geological Survey, Austin, Tex. For primary bibliographic entry see Field 4B. W74-08372

GROUND-WATER RESOURCES, ALLEGHENY RIVER BASIN AND PART OF THE LAKE ERIE BASIN, NEW YORK.

Geological Survey, Albany, N.Y.

M. H. Frimpter. New York Department of Environmental Conservation Basin Planning Report ARB-2, 1974. 98 p, 21 fig, 7 tab, 44 ref.

Descriptors: *Water resources, *Groundwater, *New York, Alluvium, Glacial drift, Water yield, Gravels, Sands, Induced infiltration, Aquifers, Water quality, Hydrologic data, *River basins. Identifiers: *Allegheny River basin(NY).

Large supplies of groundwater are available from Pleistocene sand and gravel aquifers in the valleys of the Allegheny River basin in parts of Allegany, Cattaraugus, and Chautauqua Counties in southwestern New York. The potential yield of the largest of these aquifers is estimated to be more than 220 mgd. This water-table aquifer extends up the Allegheny River valley from the Allegheny Reservoir into Pennsylvania and has an average thickness of about 80 feet. Potential yields of smaller aquifers along Great Valley, Little Valley, Fivemile, Ischua, Olean, Dodge, and Little Genesee Creeks are estimated to range from 4 to 30 mgd. A sand and gravel outwash deposit in the valley of Cold Spring Creek near Steamburg could possibly yield more than 50 mgd by induced recharge from the nearby Allegheny Reservoir. Chautauqua Lake, Cassadaga Creek, and Conewango Creek valleys contain unconsolidated artesian aquifers of small volume and recharge. The valleys of Brokenstraw and French Creeks

also contain some small water-table aquifers. Bedrock is a reliable aquifer for rural-home and farm-water supplies, except on the Lake Erie Plain where groundwater is usually salty at depths greater than 50 feet. Major aquifers usually contain water whose chemical quality is suitable for public water supplies. (Knapp-USGS) W74-08380

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1970-74.

Geological Survey, Denver, Colo. For primary bibliographic entry see Field 4B. W74-08381

DIGITAL-MODEL STUDY OF GROUND-WATER HYDROLOGY, COLUMBIA BASIN IR-RIGATION PROJECT AREA, WASHINGTON, Geological Survey, Tacoma, Wash.
H. H. Tanaka, A. J. Hansen, Jr., and J. A. Skrivan.

H. H. Tanaka, A. J. Hansen, Jr., and J. A. Skrivan. Washington Department of Ecology Water-Supply Bulletin 40, 1974. 60 p, 45 fig, 4 tab, 19 ref.

Descriptors: *Mathematical models, *Washington, *Surface-groundwater ships, *Irrigation water, Infiltration, Water balance, Water storage, Simulation analysis, Hydrogeology, Groundwater, Aquifer characteristics, Columbia River. Identifiers: *Columbia River basin.

In the Columbia Basin Irrigation Project area in eastern Washington groundwater levels generally have risen because of rapid increases in groundwater inflow, outflow, and storage from irrigation. Quantitative analyses of groundwater inflow and outflow by means of digital computer models represent three major areas-Quincy Basin, Pasco Basin, and Royal Slope. The digital computer models were designed to simulate the hydraulichead response to natural or manmade stresses in the two-aquifer system underlying the area. The two-aquifer system is an unconfined upper aquifer (clay, silt, sand, and gravel in varying amounts) overlying a confined lower aquifer (basalt), separated by a leaky confining layer. The steadystate model analyzes conditions before irrigation (1952) when inflow and outflow to the aquifer system were essentially in balance and the transient model analyzes conditions during the first 16 years of irrigation (1952-67), when rapid hydrologic changes were taking place in the aquifer system. For the Quincy model, annual inflow and outflow from both aquifers totaled 105,000 acre-feet, and average annual recharge from precipitation to both aquifers was 11,000 acre-feet; for the Pasco model, inflow and outflow from both aquifers totaled 28,700 acre-feet, and average annual recharge from precipitation to both aquifers was 5,200 acre-feet; for the Royal model, annual inflow and outflow from the lower aquifer totaled 14,800 acre-feet and average annual recharge from precipitation to the lower aquifer was 1,300 acre-feet. Cumulative storage of water between 1952-69 for the Quincy model was about 2.7 million acre-feet in the upper aquifer and about 29 thousand acre-feet in the lower aquifer; for the Pasco model it was about 3.8 million acre-feet in the upper aquifer and about 23 thousand acre-feet in the lower aquifer; and for the Royal model it was about 750 thousand acre-feet in the upper aquifer and about 14 thousand acre-feet in the lower aquifer. (Knapp-USGS) W74-08382

DISCHARGE AND TRAVEL TIME FOR GROUND-WATER CONDUITS,
University of Southern California, Los Angeles.

Dept. of Civil Engineering. For primary bibliographic entry see Field 8B. W74-08383

Field 2-WATER CYCLE

Group 2F-Groundwater

WELL YIELDS IN THE BEDROCK AQUIFERS OF MARYLAND,

Geological Survey, Parkville, Md. For primary bibliographic entry see Field 4B. W74-08446

USE OF HYDROCHEMISTRY FOR INTERPRE-TING GROUND-WATER FLOW SYSTEMS IN

CENTRAL NEVADA, Nevada Univ., Las Vegas. Desert Research Inst. G. W. Fiero, Jr., J. R. Illian, G. A. Dinwiddie, and I. J. Schroder.

Geological Survey and University of Nevada Desert Research Institute Cooperative Report for U.S. Atomic Energy Commission, April 1974. 44 p, 23 fig, 53 ref. AEC Contract No AT(29-2)-474 and AT(29-2)-1253.

Descriptors: *Groundwater movement, *Hydrogeology, *Geochemistry, *Water chemis-Descriptors: *Nevada, Aqueous solutions, Path of pollutants, Hydrology.

Groundwater movement in central Nevada was studied by hydrochemical methods. Groundwater in motion dissolves and deposits minerals in a systematic manner as it approaches chemical equilibrium with its surroundings. Flow-system in-terpretation based on hydraulic data was compared with the flow-system interpretation based on the concentration distribution of calcium, calcium plus magnesium, bicarbonate, sulfate, sodium, sodium-adsorption ratio, silica, chloride, and dissolved solids. Regional hydrochemical trends have a general relationship to regional head distribution in central Nevada. Hydrochemical conditions that are anomalous to general trends probably reflect flow-system characteristics that are difficult to interpret on the basis of hydraulic data alone. (Knapp-USGS) W74-08453

GROUNDWATER INVESTIGATIONS IN SIN-GAPORE.

Singapore Public Utilities. Water Planning Unit. For primary bibliographic entry see Field 4B.

GEOLOGY AND WATER RESOURCES OF THE GIRDWOOD-ALYESKA AREA, ALASKA, Geological Survey, Anchorage, Alaska. For primary bibliographic entry see Field 4B. W74-08595

WATER FROM THE COASTAL PLAIN AQUIFERS IN THE WASHINGTON, D.C., METROPOLITAN AREA, Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 4B.

HYDROGEOLOGY OF ANTIETAM CREEK

BASIN, Geological Survey, Parkville, Md. I. J. Nutter

Journal of Research of the U.S. Geological Survey, Vol 2, No 2, p 249-252, March-April 1974. 4 fig. 8 ref.

Descriptors: *Hydrogeology, *Maryland, *Karst hydrology, Karst, Surface-groundwater relationships, Sinks, Springs, Caves, Joints(Geologic), Carbonate rocks, Pennsylvania. Identifiers: *Antietam Creek(Md).

The Antietam Creek basin in the Great Valley of Maryland and Pennsylvania is underlain almost entirely by intensely folded and faulted lower Paleozoic carbonate rocks. The groundwater discharge of the basin is about 85% of the total discharge, in contrast with less than 70% of the total discharge in two small basins underlain by igneous and metamorphic rocks in the Maryland

Piedmont. Large quantities of groundwater are stored in a thick residual mantle, which overlies the carbonate rocks in the valley and adjacent metamorphic rocks in mountain areas on the east edge of the basin. Streams that flow off the mountain areas are major sources of recharge to the carbonate-rock aquifers. Several streams lose a large part of their flow within a mile after reaching the carbonate rocks in the valley, and a few flow directly into swallow holes (sinkholes). The low density of perennial streams in the basin is a result of subsurface drainage through solution cavities along joints, faults, and bedding in the carbonate . The major orientations of straight stream reaches along Antietam Creek and the strikes of major joint sets in quarries are nearly coincident. suggesting that the stream network throughout the basin is joint controlled. (Knapp-USGS) W74-08607

RATES OF SALT SOLUTION IN THE PERMIAN BASIN.

Geological Survey, Denver, Colo. For primary bibliographic entry see Field 2K. W74-08608

2G. Water In Soils

INLAND WETLAND SOILS,

Connecticut Agricultural Experiment Station, New Haven. D. E. Hill.

In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 30-39, December 1973. 1 fig, 2 tab.

Descriptors: *Wetlands, *Connecticut, *Legislation, *Surveys, *Soil classification, En-vironment, Regulation, Land management, Descriptors: vironment, Regu Marshes, Swamps.

Inland wetlands, as defined by Public Act 155 of the 1972 Connecticut General Assembly, are 'land, including submerged land...which consists of any of the soil types designated by the National Cooperative Soils Survey as poorly drained, very poorly drained, alluvial and flood plain.' The act thus encompasses more than 410,000 acres of wetlands soils in Connecticut as measured in three complete county surveys and estimated in the other five counties. Add the watercourses of the state, such as rivers, streams, brooks, lakes, ponds and marshes and the total acreage probably exceeds 20% of Connecticut's more than 3,200,000 acres. Use of the soil survey as a regulatory tool to define wetland boundaries may be limited if high degrees of accuracy are required in the location of the boundaries on a map. Despite the fact that the soil survey, as a regulatory tool, has mapping and classification limitations, it does provide the most complete inventory of wetland areas presently available. In the hands of a local regulatory agency, it can be used as a starting point for the necessary regulatory functions. (See also W74-08157) (Knapp-USGS) W74-08160

THE SOIL CONSERVATION AND ITS ROLE IN WETLAND MANAGEMENT FOR CONNEC-

Soil Conservation Service, Storrs, Conn For primary bibliographic entry see Field 6E. W74-08169

THERMODYNAMICS OF SOIL WATER: IV. CHEMICAL POTENTIAL OF SOIL WATER, National Inst. of Nishigahara (Japan). Agricultural

Soil Science, Vol 117, No 3, p 135-139, March, 1974. 7 fig. 3 ref.

Descriptors: Adsorption, Model studies, *Soil water, *Thermodynamics, *Montmo *Montmorillonite.

The relationship between the chemical potential of water adsorbed to K montmorillonite and film thickness of adsorbed water was theoretically calculated by establishing an adsorption model. This relationship was compared with experimentally obtained results which yielded a good comparison. In addition, the decrements of chemical potential due to the solute, the force field, and the electric field were each compared. (See also W72-08885 and W73-05108) (Merritt-FIRL) W74-08191

COMPARISON OF NUMERICAL METHODS SOLVING FLOW THROUGH POROUS MEDIA (EIN VERGLEICH VON NUMERISCHEN VER-FAHREN ZUR SICKERSTROEMUNGEN). LOESUNG

Karlsruhe Univ. (West Germany). H. P. Luehr

La Houille Blanche, No 5-6, p 433-434, 1973. 2 ref.

Descriptors: *Numerical analysis, *Flow measure-*Porous media, Finite Element analysis. ment, *Porous medicost-benefit analysis. Identifiers: Germany, Finite differences analysis.

Numerical methods of solving flow through porous media are compared and a cost effective-ness analysis was made. Digital solution methods generally are considerably more effective than analytical and analogous methods. Either finite elements or finite differences can be used in the digital solution method, and both methods produce discrete solutions of given problems. The com-parison of both methods is done by significant criteria: the required core storage, the required computing time, and the flexibility of the methods approximating the problems. As the core storage and the computing time directly depend on the organization technique and the algorithm solving linear equation systems, special organization techniques are discussed. The flexibility is seen in dependence on physical problems. Finite dif-ferences are better than finite elements in terms of organization and programming and should be used to solve flow problems through porous media. For problems involving an automatic search of free surfaces, the method of finite elements appears to be more suitable. (Merritt-FIRL) W74-08194

RETENTION AND RELEASE OF APPLIED MOLYBDENUM TO SOILS UNDER PERMANENT WATER-LOGGED CONDITION, Jawaharlal Nehru Agricultural Univ., Jabalpur

K. C. Mishra, and S. G. Misra. J Indian Soc Soil Sci. Vol 20, No 3, p 259-262.

Identifiers: *Cations, *Molybdate, *Molybdenum, *Soil types, Waterlogged soils, Alkali soils, Red soils, Black soils.

The retention and release of Mo were studied using 3 soils, black, red and alkali soils under permanent waterlogged conditions. The introduction of cations like Fe++, Cu++, Mn++, Zn++ and Al++ or anions laike CO3 = AD4 along with molybdate resulted in a varied retention of Mo and its subsequent release by the soils.—Copyright 1973, 1900

INFILTRATION INTO A SWELLING MATERI-

AL, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). D. E. Smiles.

Soil Science, Vol 117, No 3, p 140-147, March 1974. 4 fig, 11 ref.

Descriptors: *Infiltration, Flow, Clays, Theoretical analysis, Soils, Soil water movement, Soil structure, Soil texture Identifiers: Swelling, Soils.

The process of infiltration into a swelling material is discussed and some of J. R. Philip's predictions on the properties of flow in swelling systems are reexamined. Because of a paucity of experimental data on these materials Philip was forced to use plausible arbitrary properties for his illustrative calculations. A saturated clay was used and results in considerable simplification of the mathematics while the essential characteristics of the swelling phenomenon, in the gravitational field, are retained. As Philip predicts, infiltration in swelling materials has more in common physically with capillary rise than with infiltration in a rigid soil. This arises because in a saturated swelling soil infiltration is accompanied by a net increase in the gravitational potential energy of the system. Infiltration in a rigid soil results in a decrease in the potential energy of the water while that of the solid is unchanged. The net increase in the potential energy of the system together with the flow pro-perties of swelling clays results in the sorption component of the infiltration process being temporarily more persistent, by several orders of mag-nitude, than is the case for rigid soils. (Merritt-W74-08230

SURFACE WATER POLLUTION CONTRACT STUDIES: ADSORPTION OF COMPLEX OR-GANIC MOLECULES BY SUSPENDED CLAY, For primary bibliographic entry see Field 5B.

ADSORPTION STUDIES AT SOLID-SOLUTION INTERFACES.

New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources. For primary bibliographic entry see Field 5B. W74-08240

EFFECT OF EXCHANGE CATIONS ON ADSORPTION OF LYSOZYME AND OVALBUMIN

New Hampshire Univ., Durham, Inst. of Natural and Environmental Resources. For primary bibliographic entry see Field 5B. W74-08241

EFFECT OF SALT CONTENT OF EQUILIBRI-UM-SOLUTION ON FORMATION AND STA BILITY OF SMECTITE-PROTEIN COM

New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.

For primary bibliographic entry see Field 5B. W74-08242

THE MEASUREMENT OF THE HEAT OF REACTION BETWEEN PROTEINS AND MONT-MORILLONITE BY MICROCALORIMETRY, New Hampshire Univ., Durham. Water Resources Research Center. Research Center. For primary bibliographic entry see Field 5B. W74-08243

DIRECT MEASUREMENT OF WATER MOVE-MENT IN THE ZONE OF AERATION, California Univ., Davis. Coll. of Agricultural and

Environmental Sciences. D. R. Nielson, and J. C. Corey. Transactions, American Geophysical Union, Vol 55, No 4, p 183-186, April, 1974. 1 fig, 23 ref.

Descriptors: *Measurement, *Reviews, *Soil moisture, Flow measurement, Water resources, Flow, Soil water, *Soil water movement, Monitoring. Tracers.

The state of the art of three methods of direct measurement of soil water movement in the zone of aeration are reviewed. The approaches include: monitoring the rate of change of the distribution of soil water content within the zone; calculating the water movement on the basis of measured values of the forces acting on the water and the soil trans-missibility coefficients; and following the movement of a tracer to identify the direction and rate of water flow. Although accurate estimates of water flow have been obtained by using the three techniques, almost without exception, measure-ments have been confined to small plots of land only a few meters square. Measurement and pre-dictions are needed that can be applied to large land areas such as those of a field cultivated for crop production, of range or forest land, or those of sufficient size to be significant in managing land and water resources. (Merritt-FIRL) W74-08256

INORGANIC TRANSFORMATION OF ADDED PHOSPHORUS IN SOIL RELATION TO SOIL CHARACTERISTICS AND MOISTURE

Kalyani Agricultural Univ. (India). Dept. of Agricultural Chemistry and Soil Science. N. C. Debnath, and J. N. Hajra.

J Indian Soc Soil Sci, Vol 20, No 4, p 327-335. 1972. Illus.

Identifiers: Aluminum, Calcium, *Inorganic reactions, Iron, Phosphates, *Phosphorus, *Soil moisture.

Transformation of added water soluble P was studied in 5 contrasting soils, both under field moisture and waterlogged conditions. Within 24 hr, most of the added P was recovered in different inorganic fractions in the order, Al-phosphate Fe-phosphate > Ca-phosphate. Reductant soluble Fe-phosphate increased in red, laterite and hilly soils with no significant change in alluvial and saline soils. On aging, the quantity of Fe-phosphate increased and that of Al-phosphate decreased irrespective of soil characteristics and moisture regimes. On the whole, Ca-phosphate did not change much except in alluvial and saline soils. It increased in saline soils and decreased in alluvial soil on aging. Aging caused an increase in reduc-tant soluble Fe-phosphate in red and laterite soils and a decrease in hilly soil. Though the general trends of the transformation process were identical under both moisture regimes, the rate as well as the magnitude of shift in the amounts of various phosphate fractions were enhanced by higher moisture level.--Copyright 1973, Biological Abstracts, Inc. W74-08258

INFILTRATION AND ROOT EXTRACTION FROM SUBSURFACE IRRIGATION LATERALS

Minnesota Univ., St. Paul. Dept. of Agricultural For primary bibliographic entry see Field 3F. W74-08270

WATER RELATIONS AND GROWTH OF COTTON IN DRYING SOIL,
Auburn Univ., Ala. Dept. of Botany and

Microbiology.

B. Klepper, H. M. Taylor, M. G. Huck, and E. L.

Agronomy Journal, Vol 65, No 2, p 307-310, March-April, 1973. 5 fig, 1 tab, 17 ref.

Descriptors: *Irrigation, *Soil moisture, *Crop response, Cotton, Transpiration, Root develop-ment, Root systems, Diurnal.

Two 70-day-old cotton plants were subjected to a 26-day drying cycle at the Auburn rhizotron in order to quantitatively study water relations and growth of both root and shoot as the soil dried. Measurements were made of rooting density changes; stem diameter and height increase; and soil water content, soil water potential, and plant water potential. Marked dirunal fluctuations in plant hydration and soil water potential were ob-served, especially during the middle of the drying cycle. Plant height increase and stem diameter growth slowed drastically after 17 days even though 35% of the root system was in soil wetter than -1 bar and the plant was rehydrating to a water potential of -3 to -5 bars. Plant water potential in the early morning did not equilibrate with the water potential of the wettest horizon of soil. (Skogerboe-Colorado State) W74-08272

SOIL MOISTURE PROFILE UNDER STEADY INFILTRATION.

Auburn Univ. Ala. Dept. of Agricultural Engineer-

S. S. Lin, E. W. Rochester, and R. E. Hermanson Journal of Agricultural Engineering Research, Vol 18, No 3, p 179-187, September, 1973. 8 fig. 2 tab,

*Soil moisture, *Soil Descriptors: water. *Infiltration, Groundwater movement, Infiltration rates, Permeability, Porosity, Runoff.

Finite difference procedures were applied in the solution of time and space dependent differential equations describing moisture potential and content. The problem under consideration was a homogeneous soil profile with a constant water table at 120 cm. Initially the soil moisture was at static equilibrium. Constant infiltration was initiated and continued until dynamic equilibrium was approximated. The resulting moisture content and pressure profiles are presented graphically for a number of time intervals and relative infiltration values. Zones of constant moisture content and pressure are discussed. (Skogerboe-Colorado State) W74-08273

EFFECTS OF STRAW, CALCIUM CHLORIDE, AND SUBMERGENCE ON A SODIC SOIL, California Univ., Riverside. Dept. of Soil Science

camionna Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. B. S. Puttaswamygowda, and P. F. Pratt. Soil Science Society of America Proceedings, Vol 37, No 2, p 208-212, March-April, 1973. 5 fig, 3 tab, 15 ref.

Descriptors: *Saline soils, *Alkali soils, *Salinity, Leaching, Reduction(Chemical), Soil chemistry, Soil physics, Organic matter, *Anaerobic conditions, *Aerobic conditions, *Calcium chloride.

The effects of straw and CaC12 during 130 days of submergence, and the effects of these amend-ments under submerged aerobic vs. anaerobic conditions for a period of 30 days were studied. Com-parisons of pH, EC, Na, Ca + Mg, K, Fe, the opti-cal density of the water extract, and ESP were used to evaluate the effects of these amendments. The straw and straw + CaC12 treatments had the largest effect in lowering the pH and the ESP, in-creasing the Na and Ca + Mg concentrations and the EC. Submerged anaerobic conditions had the largest effect on promoting these reactions. The concentration of Fe2 was highest in the straw treatments whereas CaCl2 had a depressing effect on the soluble Fe2. The optical density was lowest in the straw plus CaCl2 amendment treated soil and the effect of this treatment was larger under anaerobic conditions. Wheat straw under anaerobic conditions caused an increase in the sum of Na plus Ca plus Mg that was about three times greater than the sum of these cations in the straw itself. In combination with CaC12 wheat straw reduced the loss of Ca from solution observed when CaC12 alone was added to soil. (Skogerboe-Colorado W74-08274

Field 2-WATER CYCLE

Group 2G-Water In Soils

DETERMINATION OF WATER INTAKE RATE

OF ADVANCE, Pant Coll. of Technology Pantnagar (India). For primary bibliographic entry see Field 3F.

CONTROLLING SOIL CRUSTING WITH PHOSPHORIC ACID TO ENHANCE SEEDLING EMERGENCE.

Agricultural Research Service, Kimberly Idaho. Snake River Conservation Research Center. For primary bibliographic entry see Field 3F. W74-08279

A COMPUTER MODEL FOR PREDICTING NITRATE AND OTHER SOLUTES AGRICULTURAL DRAIN WATER,

Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.

W74-08280

A NEW APPROACH TO SOIL TESTING: II. IONIC EQUILIBRIA INVOLVING H, K, CA, MG, MN, FE, CU, ZN, NA, P, AND S, Pennsylvania Agricultural Experiment Station, University Park.

Soil Science Society of America Proceedings, Vol. 37, No 4, p 537-541, July-August, 1973. 6 tab, 24

Descriptors: *Soil chemistry, *Ions, *Soil tests, Salinity, Soil analysis, Soil investigations, Soil properties, Soil science.

Several experiments were conducted in an effort to modify a new approach to soil testing in which the equilibrating or testing solution contains each element for which the soil is being tested. This report includes results for modification which caused 15 soils to differ more with respect to test levels of Mn, Fe, Zn, Cu, S, and P without substantially changing their rankings for K, Ca, and Mg. Modifications included the incorporation of a preservative, a flocculating agent, a pH buffer, DTPA, and several additional elements to maintain a relatively constant activity coefficient for each element in different soils. Results concluded that the adsorption equilibria soil test can be used successfully to test for several elements. The approach for calculating soil requirements is given for P. Although the test shows promise by indicating soil differences, additional calibration data will be required prior to routine use of the method. (Skogerboe-Colorado State) W74-08281

EFFECT OF PHOSPHATE SALTS AS SATURATING SOLUTIONS IN CATION-EXCHANGE CAPACITY DETERMINATIONS, Chile Univ., Santiago.

E. B. Schalscha, P. F. Pratt, T. Kinjo, and A. J.

Soil Science Society of America Proceedings, Vol 36, No 6, p 912-914, November-December, 1972. 3 tab, 19 ref.

Descriptors: *Cation exchange, *Soil chemistry, Salinity, *Phosphates, Soil physics, *Saline soils.

Cation-exchange capacities with KCl or NaNO3 in Cation-exchange capacities with KC1 or NaNO31 involcanic ash soils varied from 6 to 18 meq/100 g whereas CEC with KH2PO4 varied from 78 to 188. Cation-exchange capacities with NaH2PO4 and Na NO3 were 28 and 6, respectively, for an alfisol and 12 and 2, respectively, for an oxisol. The ratios of CEC with H2PO4(-) as compared to Cl(-) or NO3(-) varied from about 4 to 30. The effect of the H2PO4(-) is explained as a result of neutralization of positive charge in the soil with a simultaneous release of negative charge. (Skogerboe-Colorado State)

SALINE-SEEP DEVELOPMENT IN DRYLAND SOILS OF NORTHEASTERN MONTANA, Agricultural Research Service, Sidney, Mont.

For primary bibliographic entry see Field 3C. W74-08300

TWO-PHASE FLOWS IN POROUS MEDIA, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

For primary bibliographic entry see Field 2F. W74-08303

MAXIMUM CORN YIELDS WITH MINIMUM

For primary bibliographic entry see Field 3F. W74-08312

AVAILABLE WATER IN SOMI GROUPS OF MOZAMBIQUE SOILS, SOME GREAT

Instituto de Investigacao Agronomica de Mocambique, Lourenco Marquez.

Agron Mocambicana. Vol 6, No 4, p 259-266. 1972.

Agron Mocamurcana. York, 1987, P. Bright St. Brights summary. Identifiers: Alluvial soils, Ferrallitic soils, Fersiallitic soils, Hydromorphic soils, *Mozambique, *Soils types, Regression analysis, Aridic soils, *Clavs.

The relations between the available water and the clay and clay + silt percentage in ferrallitic, fer-siallitic, aridic, hydromorphic and alluvial soils are reported. All the established regression equations are of the linear form with highly significant cor relation coefficients. In all the soils studied there is a straight relation between the available water and the texture.--Copyright 1973, Biological Abstracts, W74-08313

CONCENTRATIONS PHOSPHORUS, POTASSIUM, AND TOTAL SOLUBLE SALTS IN SOIL SOLUTION SAMPLES FROM FERTILIZED AND UNFERTIL-IZED HISTOSOLS,

Florida Univ., Gainesville. Dept. of Soil Science. For primary bibliographic entry see Field 5B. W74-08319

FATE OF NITRATE FROM MANURE AND IN-ORGANIC NITROGEN IN A CLAY SOIL CROPPED TO CONTINUOUS CORN.

Vermont Univ., Burlington. Dept. of Plant and For primary bibliographic entry see Field 5B. W74-08321

INCREASED DENITRIFICATION IN SOILS BY ADDITIONS OF SULFUR AS AN ENERGY

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. For primary bibliographic entry see Field 5B. W74-08322

SIMPLE DIGESTION PROCEDURE FOR A SIMPLE DIGESTION PROCEDURE FOR ESTIMATION OF TOTAL NITROGEN IN SOILS

AND SEDIMENTS, Purdue Univ., Lafayette, Ind. Dept. of Agronomy. For primary bibliographic entry see Field 5B. W74-08324

RECYCLING AND RECOVERY OF NITROGEN, PHOSPHORUS, AND POTASSIUM BY COASTAL BERMUDAGRASS: I. EFFECT OF SOURCES AND RATES OF NITROGEN UNDER A CLIPPING SYSTEM,

Texas A and M Univ., Over Research and Extension Center. Overton. Agricultural For primary bibliographic entry see Field 5B. W74-08327

RECYCLING AND RECOVERY OF NITROGEN, PHOSPHORUS, AND POTASSIUM BY COASTAL BERMUDAGRASS: II. UNDER GRAZING CONDITIONS
STOCKING RATES. WITH Texas A and M Univ., Overton. Agricultural Research and Extension Center. For primary bibliographic entry see Field 5B.

MOVEMENT OF NITRATE NITROGEN IN SOME GRASSLAND SOILS OF SOUTHERN AL-

Department of Agricultural, Lethbridge (Alberta). Research Station. For primary bibliographic entry see Field 5B. W74-08329

CHEMICAL DISTRIBUTION OF RESIDUAL FERTILIZER NITROGEN IN SOIL AS REVEALED BY NITROGEN-15 STUDIES, Langston Univ., Okla. Dept. of Agriculture For primary bibliographic entry see Field 5B. W74-08332

TRANSIENT RESPONSE OF A LAYERED, SLOPING SOIL TO NATURAL RAINFALL IN THE PRESENCE OF A SHALLOW WATER TABLE: EXPERIMENTAL RESULTS, Agricultural Research Service, University Park. Pa. Northeast Watershed Research Center. For primary bibliographic entry see Field 2A.

SOIL POTASSIUM FORMS IN RELATION TO AGROCLIMATIC CONDITIONS IN MAHARASHTRA,

College of Agriculture, Dapoli(India). S. B. Kadrekar, and M. M. Kibe. J Indian Soc Soil Sci. Vol 20, No 3, p231-240, 1972. Identifiers: *Argo-climatic conditions, Climatic-conditions, *India(Maharashtra), *Potassium, Rainfall, *Soil potash.

The average contents of various forms of potash in Maharashtra(India) soils were 6.0, 123.3, 52.7, 668.8, 2346.7 and 6878.5 ppm of water soluble, exchangeable, available, fixed, HCl-soluble and total, respectively. When expressed as percentage of total K2O, they were found to constitute 0.08, 2.01, 0.82, 11.02 and 37.31, respectively. The lateritic and nonlateritic soils of heavy rainfall zones were, in general, found to be poor in different forms of potash whereas the soils of arid to semi-arid zones were higher in all fractions of semi-arid zones were higher in all fractions of potash. The soils of transition zone occupied an in-termediate position. The available form of potash was highly correlated not only with water soluble and exchangeable forms but also with the fixed and HCl-soluble forms. The clay fraction of the soil was positively correlated with all the forms of potash but significantly so with HCl-soluble and fixed forms.--Copyright 1973, Biological Abstracts, Inc. W74-08378

DURING PACKING OF PARTICULATES INTO CYLINDRICAL CONTAINERS, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 2J.

HYDROLYSIS AND AVAILABILITY PYROPHOSPHATE IN TROPICAL SOILS, International Inst. of Tropical Agriculture, Ibadan

(Nigeria). A. S. R. Juo, and H. O. Maduakor. Soil Sci Soc Am Proc. Vol 37, No 2, p 240-242,

Soil 363 - 364 - 365 - 3

Hydrolysis of pyrophosphate in selected Nigerian soils was found to proceed readily in the coarsesoils was found to proceed readily in the coarse-textured surface soils with half-lives ranging 4-14 days. Rate of hydrolysis was much slower in the subsoil samples studied. Subsoil samples retained large amounts of pyrophosphate which was re-sistant to hydolysis. A short-term P uptake experi-ment showed that pyrophosphate and orthophosphate were of equal efficiency when used as sources of P for plants.—Copyright 1973, Biological Abstracts, Inc. W74-08498

VERTICAL DISTRIBUTION OF FALLOUT CESIUM-137 IN CULTIVATED SOILS, Agricultural Research Service, Oxford, Miss.

Sedimentation Lab. For primary bibliographic entry see Field 5B. W74-08644

CONTRIBUTION TO THE STUDY OF THE MECHANISM OF SOIL COMPACTION: THE CONCEPT OF LUBRICATION POTENTIAL, (IN FRENCH),

Institut National de la Recherche Agronomique, Versailles (France). Station

A. Faure.

Ann Agron (Paris). Vol 22, No 5, p 487-513, 1971.

Illus. English summary. Identifiers: Lubrication potential, *Soil compac-tion, *Sand-clay mixture, Proctor technique.

With the help of materials comprising a mixture of sand and clay, compacted in a mold using the Proctor technique, it was determined that a certain volume of excess water (so called to distinguish if from the water required for swelling of the clay) is necessary to enable maximum sample compaction. This phenomenon can be explained by attributing to the excess water certain lubricating properties. On the basis of simple hypotheses incorporating the concept for a lubrication potential, and giving the sample the role of an excess water reservoir, it was possible to establish laws of variations, as a function of clay content, water content and bulk density when the sample is compacted to the max-imum. Three phases were observed: when the clay content is low (below about 10%), the lubricating action is due entirely to the excess water; when the action is due entirely to the excess water; when the clay content is from 10-18%, the lubricating action of the excess water is complemented by that of the clay present in the sample; if proportion to the clay content, exceeds 18%, the lubricating action of the excess water is complemented by that of the clay present in the sample, but is independent of the clay content. The resulting equations reveal various possibilities of behavior, depending on the swelling properties of the clay used.--Copyright 1973, Biological Abstracts, Inc. W74-08700

2H. Lakes

APPLICATIONS OF GROWTH AND SORPTION

ALGAL ASSAYS, Wisconsin Univ., Madison. For primary bibliographic entry see Field 5C. W74-08154

PANEL REVIEW AND COMMENTARY, Connecticut Univ., Storrs. Inst. of Water For primary bibliographic entry see Field 6E. W74-08172

LIMNOLOGICAL STUDIES AND REMOTE SENSING OF THE UPPER TRUCKEE RIVER SEDIMENT PLUME IN LAKE TAHOE, CALIFORNIA-NEVADA,

California Univ., Davis. Inst. of Ecology. For primary bibliographic entry see Field 2J. W74-08302

NITROGEN, CONCENTRATIONS OF PHOSPHORUS, POTASSIUM, AND TOTAL SOLUBLE SALTS IN SOIL SOLUTION SAM-PLES FROM FERTILIZED AND UNFERTIL-IZED HISTOSOLS, Florida Univ., Gainesville, Dept. of Soil Science.

For primary bibliographic entry see Field 5B. W74-08319

CHANGES IN THE HETEROTROPHIC BAC-

TERIA OF VOLTA LAKE, 1968-1971, Ghana Univ., Legon. Volta Basin Research Pro-

For primary bibliographic entry see Field 5C. W74-08434

INDICATIONS OF THE REL BETWEEN PHYTO-PLANKTON TION AND PHOSPHATE LEVELS, RELATIONSHIP DISTRIBU-Singapore Primary Production Dept. For primary bibliographic entry see Field 5C. W74-08476

DEVELOPMENT OF BLUE-GREEN ALGAL BLOOMS IN NON-ALKALINE WATERS, Singapore Univ. Dept. of Zoology. For primary bibliographic entry see Field 5C. W74-08478

CHEMICAL COMPOSITION AND MOLECU-LAR WEIGHT DISTRIBUTION OF DISSOLVED

DAGANIC MATTER PRODUCED BY BACTERI-AL DEGRADATION OF GREEN ALGAE, Dep. Chem., Tokyo Metrop. Univ., Setagaya, Tokyo Jap. Tokyo Metropolitan Univ. (Japan). Dept. of Chemistry. For primary bibliographic entry see Field 5C.

W74-08494

CHANGES OF THE NUMBER OF BACTERIAL CELLS OF DIFFERENT MORPHOLOGICAL GROUPS IN THE WATER AND BOTTOM DEPOSITS OF THE KHAKON RESERVOIR AS A FUNCTION OF THE INTENSITY OF DEVELOPMENT OF BLUE-GREEN ALGAE, (IN

UKRAINIAN), For primary bibliographic entry see Field 5C. W74-08505

OUR GREAT LAKES.

Wisconsin Univ., Madison. Sea Grant College Pro-

September, 1973. 48 p, 23 photo, 2 tab.

Descriptors: *Lake Erie, *Lake Huron, *Lake Michigan, *Lake Ontario, *Lake Superior, *Great Lakes, lakes, bodies of water, Great Lakes region, Eutrophication, Commercial fishing, Freshwater fish, International commissions, Recreation de-mand, Water pollution effects, Wastewater, In-dustrial pollution, Erosion, Water pollution, Water pollution sources, Pollution abatement, Recreation.

Thirty million people live and work on the slopes of the Great Lakes Basin. The Great Lakes in some way touch the lives of all these people. However, man's activities in and around the lakes has ever, man's activities in and around the lakes has greatly endangered them. Commercial shipping has declined due to the failure of industry to modernize, and fishing has declined due to pollution. Recreation on the lakes is endangered because of overcrowding at campsites and parks and also because of the increase of coastal construction which has eliminated many areas for-merly used for recreation. Pollution, both industrial and agricultural, has aged the lakes far beyond their years. The natural problem of erosion, made more acute by man's activities, has also endangered the lakes, particularly Lake Superior. A vast number of agencies have been created in the United States and Canada to attempt to clean the

lakes. Some progress has been made, but lack of coordination among these agencies still presents a major obstacle. The economic and environmental future of the Great Lakes Basin depends on the success of these cleanup efforts. (Flowers-Florida) W74-08531

STRUCTURE OF ONCORHYNCHUS NERKA (WALB.) ISOLATED POPULATION OF THE AZABACHYE LAKE, (IN RUSSIAN), Akademiya Nauk SSSR, Vladivostok. Institut Morskogo Biologii.

S. M. Konovalov.

Zh Obshch Biol. Vol 33, No 6, p 668-682, 1972,

Identifiers: Lakes, *Oncorhynchus-Nerka, Spawning, *USSR(Azabachye Lake), *Fish popu-

Analysis of the structure of O nerka isolated population in Azabachye lake (USSR) revealed 3 hierarchical levels. The population of O. nerka spawning in the lake includes spring and summer races which in turn consist of a great number of sub-isolated groups. Ecological niches being present, the fishes of each sub-isolated population diverge into ecological groups which form the lowest hierarchical level. The advantages of complex-structured populations as compared with panmictic ones are considered.--Copyright 1973, Biological Abstracts, Inc. W74-08548

NOURISHMENT OF RUTILUS RUTILUS ARALENSIS MORPHA FRAGMITETI BERG. OF THE KAYRAKKUM WATER RESERVOIR, (IN RUSSIAN).

Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.

L. V. Kondur.

Izv Akad Nauk Tadzh SSR Otd Biol Nauk. 3. p 84-90, 1972, Illus.

Identifiers: Reservoirs, Rutilus-rutilus-aralensis-m-fragmite, Season, *USSR(Kayrakkum reser-voir), *Fish diets, *Roach.

The nourishment of R. rutilus aralensis morpha fragmiteti found in the Krairakkum water reserve (Tadzhik SSR, USSR) was studied. Intestines (98) 10-24 cm in length were observed. Seasonal, local and measurement differences in the nourishment of this species were noted. The concurrent rela-tionship with other species of fish in the water reserve was explained.--Copyright 1973, Biological Abstracts, Inc. W74-08663

MICROBIOLOGICAL COMPARISON BETWEEN A FEW AQUATIC MEDIUMS, (IN

Poiters Univ. (France). Unite d'Enseignment et de Recherche de Medicine et Pharmacie For primary bibliographic entry see Field 5C. W74-08669

HETEROTROPHIC POTENTIAL FOR AMINO

ACID UPTAKE IN A NATURALLY EUTROPHIC LAKE, Oregon State Univ., Corvallis. Dept. of Microbiology.; and Oregon State Univ., Corvallis. School of Oceanography. For primary bibliographic entry see Field 5C. W74-08678

BIOLOGY OF ARCTODIAPTOMUS TILOBATUS SARS (COPEPODA, CRUSTACEA) IN THE MINGECHAUR WATER RESERVOIR. (IN RUSSIAN),

A. G. Kasymov, and I. A. Akhmedov. Izv Akad Nauk Az SSR Ser Biol Nauk. 3, p 95-100, 1971.

Field 2—WATER CYCLE

Group 2H—Lakes

Arctodiaptomus-acutilobatus, *Copepoda, Crustacea, *Reproduction, Reservoirs, Sex, *USSR(Mingechaur reservoir).

This small copenod was studied in 1965-1966. As a year-round form it gave 2 maxima during a year-in the spring and fall. Under experimental conditions at a 10.4 deg C water temperature the brood pouch was formed in 55 days, at 7.5 deg C in 64 days, but at 20.7 deg C in only 30-31 days. Average number of eggs in 1 brood pouch was 8. In the summer, the copepod gave dormant eggs. Each female produced 6 generations during the propagation period. During the first part of the year females predominated over males in the Mingechaur water reservoir, then the sex ratio leveled off gradually, and beginning with June the cycle was reversed. This phenomenon was also observed in Dec.--Copyright 1973, Biological Abstracts, Inc. W74-08683

2I. Water In Plants

CHARACTERISTIC USE OF GENETIC PRINCI-PLES IN THE CLASSIFICATION OF NORTH KAZAKHSTAN FORESTS ON THE ANCIENT CRUSTS OF WHEATHERING AND QUATERNARY DEPOSITS, (IN RUSSIAN), V. N. Birvukov. N. Biryukov.

Tr Kaz Nauchno-Issled Inst Lesn Koz. 7 n 44-51.

Identifiers: Aspen, Birch, Brachypodium-Sylvaticum, Calamagrostic, Carex, Classification, Crusts, Festuca-Ovina, Filipendula, *Forests, principles, Minerals. Glycyrrhiza, Grass, Pine. *Quaternary Lysimachia, Pine, *Quaternary *USSR(Kazakhstan), deposits, Rubus-Saxatilis, *Weathering.

An enumeration of forest types, including the basic characteristics of the growing conditions is given. Among the primeval stand types are the Calamagrostis-Rubus saxatilis-pine forests (on the summits and the upper parts of the ridges), Calamagrostis-Glycyrrhiza-pine (on the runoff ravines in the plains), Brachy-podium sylvaticum pine (the medium and the lower parts of the ridges), Festuca ovina-pine (the interridge depressions), Filipendula-Lysimachia-pine (slightly drained ridge trains), forb-grass pine (sinkholes), as well as forb-berry and forb birch forests and Carex-Filependula aspen forests formed on saline soils. The possible successions of stand types are shown. The hydrological regime of individual habitats is the most important factor the formation of the forest vegetation; next in importance is the mineral salt content. -Copyright 1973, Biological Abstracts, Inc.

CONSIDERING IRRIGATED GRASS. TAKE A TIP FROM NEW MEXICO.

For primary bibliographic entry see Field 3F. W74-08282

AQUATIC ORGANISMS FROM SELECTED SITES ALONG THE PROPOSED TRANS-ALASKA PIPELINE CORRIDOR, SEPTEMBER 1970 TO SEPTEMBER 1972,

Geological Survey, Anchorage, Alaska. J. W. Nauman, and D. R. Kernodle. Basic-Data Report, 1974. 23 p, 1 fig, 3 tab, 12 ref.

Descriptors: *Aquatic animals, *Aquatic life, *Alaska, Sampling, Monitoring, Water pollution effects, Pipelines, Data collections, Water quality. Identifiers: *Trans-Alaska pipeline, Aquatic organisms.

Biological data were collected along the proposed trans-Alaska pipeline corridor from Prudhoe Bay to Valdez including the terminal site at Port Val-dez. Benthic invertebrates and other miscellaneous aquatic organisms were collected in 314 samples including artificial substrate, Surber, Ekman dredge, dip net, and 10-rock samples from 62 sites (33 streams, 3 lakes, and 1 fjord-type estuary). The data provide a basis for evaluating naturally occurring and man-induced changes of water quality along the proposed trans-Alaska pipeline corridor. The alteration of normal faunal composition and abundance of benthic invertebrates can provide an indicator of adverse environmental change. (Knapp-USGS)
W74-08369

GENERALIZATION OF SPAWNING AND REARING DISCHARGES FOR SEVERAL PACIFIC SALMON SPECIES IN WESTERN WASHINGTON,

Geological Survey, Tacoma, Wash. M. R. Collings. Open-file report, 1974. 39 p, 7 fig, 7 tab, 16 ref.

Descriptors: *Salmon, *Washington, *Fisheries, *Discharge(Water), *Spawning, Fish reproduction, Fish establishment, Life cycles, Commercial

Equations can be used to estimate stream discharges desirable for spawning and rearing by fall chinook, spring chinook, sockeye, coho, pink, and chum salmon in western Washington. Preferred spawning discharge in the discharge that will provide the maximum area for salmon spawning. Spawning-sustaining discharge is a smaller flow such that the percentage reduction in spawnable area equals the percentage reduction in discharge, but is not less than 75% of the preferred discharge. Rearing discharges are based on the shape of the stream channel. Regression equations were developed between (1) preferred and spawning-sustaining discharges for each salmon species, (2) preferred and spawning-sustaining discharges and the basin and stream-channel parameters for each salmon species, (3) rearing discharges and the basin and stream-channel parameters, and (4) mean spawning-sustaining and mean preferred spawning discharges and the basin and stream-channel parameters. The empirical equations determined for the generalization of the spawning and rearing discharges given in this report represent the data presently available. (Knapp-USGS) W74-08370

WOODY PHREATOPHYTES ALONG THE COLORADO RIVER FROM SOUTHEAST RUN-NELS COUNTY TO THE HEADWATERS IN BORDEN COUNTY, TEXAS,

Geological Survey, Austin, Tex. For primary bibliographic entry see Field 3B.

FOOD NICHE OF GRAUS NIGRA PHILIPPI (OSTEICHTHYES, LABRIDAE), Chile Univ., Santiago. Laboratorio de

Hidrobiologia. C. Moreno.

Mus Nac Hist Nat Not Mens (Santiago). Vol 16, No 186, p 5-6, 1972. Identifiers: "Chile, *Food niche, *Graus-Nigra, Labridae, Osteichthyes, Taliepus-Marginatus,

Tetrapygus-Niger.

This fish is a common sp. of the sublittoral of central and northern Chile, being found at its greatest density between 1-8 m deep. During the day it hides in irregularities of the rocks and it is hard to find it swimming. It may reach a length of 80 cm and weight of 10 kg, and is thus attractive to sports fishermen. With the collaboration of divers, 13 specimens were obtained at Cartagena and Horcon, and stomach contents were examined. The chief prey were Taliepus marginatus and Tetrapygus niger. Other species less frequently found in the stomach are listed. The data are tabulated.—Copyright 1973, Biological Abstracts, Inc. W74-08526 AN INVESTIGATION OF THE FOOD OF ONE-TO FOUR-MONTH-OLD SALMON FRY (SALMO SALAR L.) IN THE SULDALSLAGEN, WEST NORWAY.

Zoologisk Museum, Oslo (Norway). A. Lillehammer.

A. Luenammer Norw J Zool, Vol 21, No 1, p 17-24, 1973. Illus. Identifiers: Chironomidae, Crusta *Norway(Suldalslagen), Plankton, Plecopt Rivers, Salmo-salar, *Salmon fry, *Fish diets. Crustacea, Plecoptera,

In the river Suldalslagen feeding activity of salmon fry starts at a temperature of about 5 deg C and be-fore the yolk has been absorbed. The most impor-tant foods were Chironomidae larvae. Plecoptera nymphs and planktonic crustacea. Chironomidae and Plecoptera dominated the fauna associations of the river bottom in June and July. Planktonic Crustacea, which drifted from lake Suldalsvatn, were numerous in Aug., and were the most common food item for the fry in Aug. and Sept. The invertebrates taken for food were of low mean weight, mostly less than 10 mg. In number they formed between 60 and 90% of the total bottom fauna. In terms of biomass they never reached 25% of the total bottom fauna in any one month.--Copyright 1973, Biological Abstracts, Inc. W74-08679

NOTES ON THE FEEDING RELATIONSHIPS OF TROUT (SALMO TRUTTA L.) AND SAL-MON (SALMO SALAR L.) IN THE RIVER SUL-DALSLAGEN, WEST NORWAY,

Zoologisk Museum, Oslo (Norway).

A. Lillehammer.
Norw J Zool, Vol 21, No 1, p 25-28, 1973.
Identifiers: *Norway(River Suldalslagen), Rivers,
Salmo-salar, Salmo-trutta, *Salmon, *Trout, *Fish

Investigations were made of the feeding relationships of young salmon and trout in the river Sul-dalslagen, west Norway. The results indicate the dalstagen, west Norway. The results mulcate me differences in feeding behavior between the 2 spe-cies in the river and in the tributary streams. In the river there are only small differences in feeding behavior of salmon and trout fry. In older fish there seem to be greater differences in feeding upon certain food groups, especially planktonic Crustacea.—Copyright 1973, Biological Abstracts, Inc. W74-08680

THE FISH OF THE SOUTH WESTPHALIAN HIGHLAND INCLUDING THE MOEHNE DAM AND RUHR.

Landesanstalt Fischerei, Kirchhundem (West Germany). E. Tack.

Decheniana, Vol 125, No 1/2, p 63-77, 1972. Illus. Identifiers: Anguilla-anguilla, Barbus-barbus, Coregonus-albula, Esox-lucius, *Fish, Gobiogobio, Highland, Leuciscus-cephalus, Noemachei-lus-barbatulus, Phoxinus-phoxinus, *Ruhr River, Rutilus-rutilus, Salmo-gairdneri, Salmo-trutta-F-fario, Salmo-trutta-F-lacustris, Salvelinus-alpinus-chedicus, Thura-thick thirt, Mex. 400. salvelinus, Thymallus-thymallus, many(Westphalia).

A study of the fish species of the South Westphalian Highland (W. Germany) revealed a total of 31 spp. with 20 being autochthonous, and the rest having been imported in the 20th century. The low number of species is primarily due to the lack of standing waters. The upper and middle reaches of the numerous creeks in this area are populated mostly by trout of which Salmo trutta f. fario is a representative species. Other species found in creeks are Rutilus rutilus L., Thymallus thymallus L., Gobio gobio L., Barbus barbus L., Leuscicus cephalus L., Anguilla anguilla L., Phoxinus phoxinus L., Noemacheilus barbatulus L., Salmo gairdneri and Esox lucius L. The Moehne dam accommodates Salmo trutta f. lacustris, Salmalinus phorium L. and Construction. velinus alpinus salvelinus L. and Coregonus albula L. which are artificially introduced deepwater species.--Copyright 1973, Biological Abstracts, Inc.

W74-08681

UTILIZATION PATTERNS OF THE DEEP WATER BY A WEEPING LOVEGRASS CROP (ERAGROSTIS CURVULA NEES), IN A CERAGROSTIS CURVULA NEES), REGOSOL SOIL OF THE PASEMIARID REGION, (IN SPANISH), PAMPEAN

Estacion Experimental Regional Agropecuaria, Anguil (Argentina). M. Fagioli.

Rev Invest Agropecu Ser 3 Clima Suelo. Vol 9, No 2, p 61-70, 1972. Illus. (English summary).

Identifiers: Arid lands, Eragrostis-curvula, *Grasses, Lovegrass, Pampean, *Water consump-Identifiers: tion, *Argentina(Pampean *Soils(Regosol), Soil moisture.

Water consumption in the summer reached 4-5 mm/day in soils well provided with moisture. Weeping lovegrass drew out soil moisture from depths as low as 330 cm. Some longer roots probably grew deeper, but their number was not high enough to determine measurable moisture variations.--Copyright 1973, Biological Abstracts, Inc. W74-08682

STUDIES ON THE DEVELOPMENT OF THE NEMATODE RHABDOCHONA (FILOCHONA) ERGENSI MORAVEC, 1968, Ceskoslovenska Akademie Ved, Prague.

Ceskoslovenska Ak Parazitologicky Ustav.

F. Moravec. Folia Parasitol (Prague). Vol 19, No 4, p 321-333,

1972. Illus.

Identifiers: *Filochonk, Habroleptoides-modesta, Mayfly, *Nematodes, Noemacheilus-barbatulus, Rhabdochona-ergensi, Subgenus, Helminth, *Fish parasites.

The development of the nematode R. ergensi parasitizing the intestine of the fish Noemacheilus barbatulus was studied experimentally. As intermediate hosts only mayfly nymphs Habrolep-toides modesta (Hag) were employed that were successfully infected with eggs of this helminth. In the body of the intermediate host the larvae of R. ergensi molt twice before they reach the third infective larval stage (after 22 days at water temperature 13-15 C) which becomes encysted. The development, however, does not cease and the larvae in the intermediate host can molt once more and change into the 4th-stage larvae. The infected mayfly nymphs were fed to the fish N. barbatulus In this definitive host the larvae of R. ergensi molted once more (the 4th molt), before they attained maturity; the male developed within 20 days, juvenile females within 33 days, the depositing of mature eggs was observed after 43 days.--Copyright 1973, Biological Abstracts, Inc.

EXTENSIONS OF CORBICULA MANILENSIS (PHILIPPI) IN THE ATLANTIC DRAINAGE OF THE UNITED STATES, Academy of Natural Sciences of Philadelphia, Pa.

Academy of Natural Sciences of Philadelphia, Pa. S. L. H. Fuller, and C. E. Powell, Jr. Nautilus. Vol 87, No 2, p 59, 1973. Identifiers: *Atlantic coastal region, *Corbiculamanilensis, Drainage, *United States, Delaware River, Savannah River, Pee Dee River.

Corbicula manilensis is newly recorded from the Savannah, Pee Dee, and Delaware river systems in the Atlantic drainage of the USA.--Copyright 1973, Biological Abstracts, Inc. W74-08685

STUDIES OF THE HELMINTH FAUNA OF NORWAY, XXVI: THE DISTRIBUTION OF CYATHOCEPHALUS TRUNCATUS (PALLAS) IN THE INTESTINE OF BROWN TROUT (SALMO TRUTTA L.), Zoologisk Museum, Oslo (Norway).
O. Halvorsen, and S. MacDonald.

Norw J Zool. Vol 20, No 4, p 265-272,1972. Illus. Norw J Zool. Vol 20, No. 9, p 20-22-17/2 mand Identifiers: *Brown trout, Cripidostomum-metoecus, *Cyathocephalus-Truncatus, Distribu-tion. *Helminth fauna, Intestine, *Norway, Salmo-Trutta, *Fish parasites.

C. truncatus attached preferentially in the anterior caeca of the intestine of the brown trout. S. trutta. Site selection was particularly marked in the small group of caeca which lie dorsally to the intestine in an area adjacent to the bile duct opening. In trout parasitized only by digenean Cripidostomum metoecus the anterior caeca were again the preferred site.--Copyright 1973, Biological Ab-W74-08699

2.J. Erosion and Sedimentation

ECOLOGICAL HISTORY OF WETLANDS, Yale Univ., New Haven, Conn. Dept. of Biology. For primary bibliographic entry see Field 2L. W74-08165

EROSION CONTROL ON HIGHWAY CON-STRUCTION.

National Academy of Sciences, Washington, D.C. Highway Research Board. For primary bibliographic entry see Field 4D. W74-08178

CONCEPTS OF CONSERVATION TILLAGE SYSTEMS USING SURFACE MULCHES, Nebraska Univ., Lincoln. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 3F. W74-08277

SEDIMENTOLOGY AND BAR FORMATION IN THE UPPER KICKING HORSE RIVER, A BRAIDED OUTWASH STREAM.

Illinois Univ., Chicago. Dept. of Geological Sciences N. D. Smith.

Journal of Geology, Vol 82, No 2, p 205-223, March 1974. 17 fig, 24 ref. NSF Grant GA-28727.

Descriptors: *Sedimentology, *Braiding, *Glacial drift, *Alluvial channels, *Canada, Sedimentary structures, Sedimentation, Sediment sorting, Gravels, Sands, Silts, Mud, Sand bars. Identifiers: *Kicking Horse River(BC), Outwash.

Bar formation and sediment distribution patterns were examined in a 4-mile braided reach of the upper Kicking Horse River at Field, British Columbia, which is mainly supplied by meltwater from icefields. Marked diurnal variations in discharge, suspended sediment concentration, and water temperature occur during peak summer melting periods when rates of sediment transport and bar formation are greatest. Bed material is mostly limestone and dolomite gravel which undergoes rapid fining in the downstream direction. Gravel bars occurring in a wide variety of shapes and sizes are the dominant bed forms. Most exposed braid bars have undergone complex depositional and erosional histories and rarely show simple or consistent patterns of grain size or structures, either internal or superficial. Active bars with simple histories and predominantly depositional morphologies are termed unit bars. Four general unit bar forms are recognized in the Kicking Horse, with a variety of intermediate forms existing among them; longitudinal, transverse, point, and diagonal. The first three generally form parallel to channel flow; they tend to fine downstream, fine upward, and consist of finer-grained material than adjacent channels. Growth may be downstream or sideways, depend-ing on characteristics of local flow and channel morphology. Diagonal bars form with long axes oblique to flow and appear to lack the grain-size

trends of the other unit bar forms. Stratification is mostly massive or horizontal. (Knapp-USGS) W74-08297

MINERALOGY OF SURFACE SEDIMENTS FROM THE PANAMA BASIN, EASTERN EQUATORIAL PACIFIC,

Oregon State Univ., Corvallis. School of Oceanog-

G. R. Heath, T. C. Moore, Jr., and G. L. Roberts. Journal of Geology, Vol 82, No 2, p 145-160, March 1974. 13 fig, 23 ref. ONR Contract N00014-67-A-039-0007

Descriptors: *Clay minerals, *Bottom sediments, *Pacific Ocean, *Mineralogy, Distribution patterns, Ocean currents, Illite, Kaolinite, Currents(Water), Sediment sorting. Identifiers: *Panama Basin, Chlorite.

Sediments of the Panama Basin contain more than 90% nonbiogenous components adjacent to Central and South America, but less than 5% in the area west of the Galapagos Islands. The nearshore deposits are quartz-rich, with clay fractions consisting of roughly equal amounts of chlorite, illite, and kaolinite. These sediments are dispersed over distances of several hundred kilometers by currents in waters of intermediate depth (below the photic zone, but not deep enough to be affected by bottom topography), and to a lesser extent by bottom currents that flow through the deepest parts of the basin. In the outer parts of the basin, the nonbiogenous deposits are quartz-poor, with clay fractions dominated by authigenic montmorillonite. Winnowing and lateral reworking at the sea floor, which strongly affect the distribution of biogenous components, have little effect on the patterns of occurrence of the clay minerals. (Knapp-USGS) W74-08298

SUSPENDED SOLIDS ANALYSIS USING ERTS-A DATA.

Pennsylvania Univ., Philadelphia. Moore School of Electrical Engineering.
H. Kritikos, L. Yorinks, and H. Smith.

Remote Sensing of Environment, Vol 3, No 1, p 69-78, 1974. 6 fig. 4 tab, 19 ref.

Descriptors: *Remote sensing, *Turbidity, *Suspended load, Rivers, Satellites(Artificial), Surveys, Pollutant identification, *Potomac River.

Suspended solids were measured in the Potomac River using data from magnetic digital tapes of the imagery obtained by ERTS-A on September 23, 1972. A statistical analysis of all four bands was carried out. Band III is useful in determining the water-to-land interface. Data on bands II suggest the existence of three distinct types of waterthose having low, medium, and high reflectivity. The areas of high reflectivity were identified as containing high concentrations of suspended solids. Areas of low reflectivity were identified as having relatively lower concentrations of suspended solids. A commonly used computer technique with some additional refinements was used to generate thematic maps which identify the above areas and show their geographical distribution. (Knapp-USGS) W74-08301

LIMNOLOGICAL STUDIES AND REMOTE SENSING OF THE UPPER TRUCKEE RIVER SEDIMENT PLUME IN LAKE TAHOE, CALIFORNIA-NEVADA,

California Univ., Davis. Inst. of Ecology. C. R. Goldman, R. C. Richards, H. W. Paerl, R. C. Wrigley, and V. R. Oberbeck.

Remote Sensing of Environment, Vol 3, No 1, p 49-67, 1974. 8 fig. 1 tab, 17 ref. EPA Grant DBU 16010 and NSF RANN Grant GI-22.

Field 2-WATER CYCLE

Group 2J-Erosion and Sedimentation

Descriptors: *Remote sensing, *Aerial photography, Lakes, *Turbidity, Path of pollutants, Suspended load, Nutrients, Eutrophication, *California, *Nevada, Sedimentation, Productivi-

Identifiers: *Lake Tahoe, *Sediment plumes

The Upper Truckee River sediment plume in Lake Tahoe was studied using aerial photography and simultaneous measurements in the lake. The studies covered river discharge conditions during the snowmelt-runoff period in the spring of 1971. Color and multispectral aerial photography allowed delineation of the extent and relative density of four to five units within each plume. Simple correlation coefficients are high between these units and measures of suspended sediment, dissolved inorganic carbon, and light penetration, as well as measures of primary productivity and heterotrophic activity. Corelations are inconsistent between the above variables and nutrients. Two studies were conducted in the morning and afternoon of a single day; the plume's eastward shift during the day was recorded photographically and with limnological measurements. High correlations between sediment plumes and biological conductivity coupled with evidence that silt particles and associated nutrients stimulate bacterial growth indicate that sediment plumes are accelerating the eutrophication of Lake Tahoe.
(Knapp-USGS)
W74-08302

SOME RATES OF GEOMORPHOLOGICAL PROCESSES,

Geological Survey, Washington, D.C. L. B. Leopold, and W. W. Emmett. Geographia Polonica, Vol 23, p 27-35, 1972. 3 fig, 3 tab, 3 ref.

Descriptors: *Geomorphology, *Creep, *Mass wasting, *Channel morphology, Slopes, Alluvial channels, Urbanization, Erosion, Sedimentation, *Potomac River.

The rate of movement of soil on hillslopes was measured, especially movement by mass movement or slow gravitational creep. Downhill motion increases slightly with gradient but is less sensitive to gradient than is surface erosion. Where local gradient is less than 15 deg the hillslopes studied do not experience either surface erosion or downslope mass movement. At Cabin John, Md., despite the thick layer of regolith, downhill creep was measurable only in the upper 3 to 6 cm. The amount of this motion was less than the measurement error in 2 out of 6 pits. The amount of movement varied from 0 to 9 mm in 7 years. Changes in the channel of a small perennial stream, Watts Branch, a tributary to the Potomac River, were measured. The land use in the surveyed zone has been pasture. During the 17 years urbanization has encroached on portions of the headwaters. The progressive decrease of channel area can at least in part be attributed to the increased loads of suspended sediment attributed to land opened for construction. The construction of houses has decreased the amount of drainage area devoted to farming, but in 1970 the majority of the area was still farmland. In 17 years the channel has decreased in cross-sectional area on average of 1.7% per year. For those cross sections measured during the full 17 years, the 1970 channel is 0.66 that existing in 1953, a loss of 28 square feet out of an original 83 square feet. Most of this is due to narrowing by the plastering of silt on channel banks. The width-depth ratio has decreased. The streambed elevation has risen 0.4 foot but the channel slope has not changed significantly. The largest lateral movement on any cross section was 20 feet or about one channel width. (Knapp-USGS) W74-08304

SEDIMENT ROUTING IN IRRIGATION CANAL Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. K. Mahmood

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 100, No IRI, Paper 10401, p 49-67, March 1974. 8 fig. 3 tab, 12 ref, append. US AID Contract, No AID/csd-

Descriptors: *Sediment transport, *Irrigation water, Routing, Sedimentation, Canals, Sediment control, Simulation analysis, Numerical analysis,

The routing of bed material load through a branching irrigation canal system may be calculated in such a way as to insure sediment discharge equilibrium. All the sediment entering the system is disposed of with the water. The system equilibri-um can be more easily achieved if smaller sediment concentrations are allocated to irrigation diversions from smaller channels. An approximate numerical model predicts the bed material load from farm turnouts. (Knapp-USGS) W74-08385

CLARKS FORK YELLOWSTONE RIVER REMOTE SENSING STUDY,
Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. J. F. Ruff, J. W. Keys, III, and M. M. Skinner.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY6, Paper 10584, p 719-729, June 1974. 5 fig, 1 tab, 8

Descriptors: *Remote sensing, *Sediment transport, *Wyoming, *Montana, Sediment load, Sedimentation, Aerial photography, Infrared radiation, Surveys, Turbidity, Path of pollutants. Identifiers: *Clarks Fork Yellowstone River(Wyo-

The Clarks Fork Yellowstone River of Montana and Wyoming was investigated by remote sensing to locate points at which sediment loads enter the river and to estimate the relative magnitude of sediment concentrations in the tributary flows. Remote sensing techniques were selected for the study to provide adequate coverage of a large portion of the river and to evaluate its use in monitoring and studying sediment movements in a river system. The basic procedure for the investigation involved the ground-truth data program to collect physical information from the study area, aerial flights to obtain the necessary color infrared photographs and thermal imagery, and the in-terpretation and analysis of results from these data collection programs. Aerial color infrared photography and thermal infrared imagery are efficient and practical tools for locating and identifying inflow of sediment-laden water to a river system.
(Knapp-USGS)
W74-08386

MECHANISM FOR STREAMFLOW MEANDER-

British Columbia Univ., Vancouver. Dept. of Civil Engineering. For primary bibliographic entry see Field 8B.

W74-08388

PARTICLE-SIZE SEGREGATION DURING PACKING OF PARTICULATES INTO CYLINDRICAL CONTAINERS,

Collaboration Containers, Geological Survey, Menlo Park, Calif.
C. D. Ripple, R. V. James, and J. Rubin.
Powder Technology, No 8, p 165-175, 1973. 9 fig, 1

Descriptors: *Particle size, *Sediment sorting, Soil tests, *Soil investigations, Bulk density. Identifiers: *Soil packing.

Soil columns produced by deposition and simultaneous vibratory compaction in cylinders were dense and axially uniform, but showed significant radial segregation of particle sizes. Similar results were obtained with depositions and simultaneous impact-type compaction when the impacts resulted in significant container bouncing. This procedure, modified to minimize bouncing, produced dense, uniform soil columns, showing little radial particle-size segregation. Other procedures tested (deposition alone and deposition followed by compaction) did not result in radial segregation, but produced columns showing either relatively low or axially nonuniform densities. Radial particle-size segregation is mainly due to vibration-induced particle circulation in which particles of variousizes have different circulation rates and paths. (Knapp-USGS) W74-08447

EROSION CONTROL AND BANK STABILIZA-TION IN METROPOLITAN TORONTO--10 YEAR PROGRAMME AND 5 YEAR PROJECT. Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario). For primary bibliographic entry see Field 4D. W74-08488

THE NATIONAL SHORELINE STUDY, Corps of Engineers, Portland, Oreg. For primary bibliographic entry see Field 2L. W74-08671

2K. Chemical Processes

SURFACE-WATER AVAILABILITY, COLBERT COUNTY, ALABAMA. Geological Survey, Tuscaloosa, Ala For primary bibliographic entry see Field 4A. W74-08187

WATER AVAILABILITY, COOSA COUNTY, ALABAMA, Geological Survey, Tuscaloosa, Ala

For primary bibliographic entry see Field 4A. W74-08188

SURFACE-WATER AVAILABILITY. LIMESTONE COUNTY, ALABAMA, Geological Survey, Tuscaloosa, Ala For primary bibliographic entry see Field 4A. W74-08189

SURFACE-WATER AVAILABILITY, ETOWAH COUNTY, ALABAMA, Geological Survey, Tuscaloosa, Ala. For primary bibliographic entry see Field 4A. W74-08190

THERMODYNAMICS OF SOIL WATER: IV. CHEMICAL POTENTIAL OF SOIL WATER, National Inst. of Agricultural Nishigahara (Japan). For primary bibliographic entry see Field 2G. W74-08191

RETENTION AND RELEASE OF APPLIED MOLYBDENUM TO SOILS UNDER PERMANENT WATER-LOGGED CONDITION, Jawaharlal Nehru Agricultural Univ., Jabalpur (India). For primary bibliographic entry see Field 2G. W74-08209

INORGANIC TRANSFORMATION OF ADDED PHOSPHORUS IN SOIL RELATION TO SOIL

MOISTURE CHARACTERISTICS AND REGIME,

Kalyani Agricultural Univ. (India). Dept. of Agricultural Chemistry and Soil Science For primary bibliographic entry see Field 2G. W74-08258

EFFECTS OF STRAW, CALCIUM CHLORIDE, AND SUBMERGENCE ON A SODIC SOIL, California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.

For primary bibliographic entry see Field 2G. W74-08274

A NEW APPROACH TO SOIL TESTING: II. IONIC EQUILIBRIA INVOLVING H, K, CA, MG, MN, FE, CU, ZN, NA, P, AND S, Pennsylvania Agricultural Experiment Station,

University Park For primary bibliographic entry see Field 2G. W74-08281

EFFECT OF PHOSPHATE SALTS AS SATURATING SOLUTIONS IN CATION-EXCHANGE CAPACITY DETERMINATIONS,

Chile Univ., Santiago. For primary bibliographic entry see Field 2G. W74-08285

GROUND WATER QUALITY EFFECTS ON DOMESTIC WATER UTILIZATION,

Univ. of Alaska College. Inst. of Water Resources. For primary bibliographic entry see Field 5B. W74-08287

RECORDS OF WATER WELLS, SPRINGS, OIL-AND GAS-TEST HOLES, AND CHEMICAL ANALYSES OF WATER FOR THE MADISON LIMESTONE AND EQUIVALENT ROCKS IN THE POWDER RIVER BASIN AND ADJACENT AREAS, NORTHEASTERN WYOMING,

Geological Survey, Cheyenne, Wyo. For primary bibliographic entry see Field 4B. W74-08296

ELECTROANALYTICAL STUDIES OF METHYLMERCURY IN AQUEOUS SOLUTION, Hercules Research Center, Wilmington, Del. For primary bibliographic entry see Field 5A. W74-08362

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE RIO GRANDE BASIN, TEXAS, Geological Survey, Austin, Tex.

For primary bibliographic entry see Field 5B. W74-08373

SOIL POTASSIUM FORMS IN RELATION TO AGROCLIMATIC CONDITIONS MAHARASHTRA.

College of Agriculture, Dapoli(India). For primary bibliographic entry see Field 2G. W74-08378

A SIMPLY CONSTRUCTED AND ADJUSTABLE MERCURY VAPOR CELL MOUNT, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 7B. W74-08379

USE OF HYDROCHEMISTRY FOR INTERPRE-TING GROUND-WATER FLOW SYSTEMS IN CENTRAL NEVADA, Nevada Univ., Las Vegas. Desert Research Inst.

For primary bibliographic entry see Field 2F W74-08453

COMPENSATION CARBONATE DEPTH: RELATION TO CARBONATE SOLUBILITY IN

OCEAN WATERS, California Univ., Los Angeles. Dept. of Geology. S. Ben-Yaakov, E. Ruth, and I. R. Kaplan. Science, Vol 184, No 4140, p 982-984, May 31, 1974. 2 fig, 11 ref.

Descriptors: *Calcite, *Saturation, *Sea water, *Water chemistry, On-site investigations, Carbonates, Calcium carbonate, Solubility. Identifiers: Carbonate saturometer.

The intermediate water masses of the central Pacific Ocean are close to saturation with respect to both calcite and local carbonate sediment. The carbonate compensation depth, located at about 3700 meters in this area, appears to represent a depth above which waters are essentially saturated with respect to calcite and below which waters deviate toward undersaturation with respect to calcite. The study was conducted in two adjacent areas, one south of the Hawaiian Islands chain and the other about 1300 km northeast of the islands. Direct determinations of CaCO3 solubility were conducted with an in situ carbonate saturometer. (Knapp-USGS) W74-08582

WATEQ, A COMPUTER PROGRAM FOR CAL-CULATING CHEMI NATURAL WATERS, CHEMICAL EQUILIBRIA

Geological Survey, Menlo Park, Calif. A. H. Truesdell, and B. F. Jones. Journal of Research of the U.S. Geological Survey, Vol 2, No 2, p 233-248, March-April 1974. 4 tab. 76 ref.

Descriptors: *Computer programs, *Water chemistry, Water analysis, Equilibrium, Solutes, Aqueous solutions, Thermodynamics, Water quality, Chemical analysis, Temperature, Hydrogen ion concentration, Oxidation-reduction

The computer program, WATEQ, calculates the equilibrium distribution of inorganic aqueous species of major and important elements in natural waters using the chemical analysis and in situ measurements of temperature, pH, and redox potential. From this model, the states of reaction of the water with solid and gaseous phases are calculated. Thermodynamic stabilities of aqueous species, minerals, and gases were selected from a careful consideration of all available experimental data. The program is written in PL-1 for IBM 360 computers. (Knapp-USGS) W74-08606

RATES OF SALT SOLUTION IN THE PERMIAN

Geological Survey, Denver, Colo. F. A. Swenson.

Journal of Research of the U S Geological Survey, Vol 2, No 2, p 253-257, March-April 1974. 1 fig, 13

Descriptors: *Salts, *Sodium chloride, *Leaching, *Radioactive waste disposal, Karst hydrology, Groesticides, Environmental effects, Aquatic environment, Aquatic animals, Aquatic plants, Estuarine environment.

Identifiers: Seeding oil spills, Bacterial seeding, Crude oils, Pollutant effects, Marine environment, Freshwater environment.

Thirty-two papers constitute the proceedings of the workshop which was held to determine the present status of knowledge concerning the use of microorganisms in facilitating oil biodegradation, to assess future areas of investigation, to promote cooperative research projects, and to promote exchange of information. Papers are separately abstracted. (See W74-08610 thru W74-08641) (Sinha W74-08608

WATER: A COMPREHENSIVE TREATISE.
VOLUME 1. PHYSICS AND PHYSICAL
CHEMISTRY OF WATER. For primary bibliographic entry see Field 1A. W74-08665

WATER: A COMPREHENSIVE TREATISE. VOLUME 2. WATER IN CRYSTALLINE VOLUME 2. WATER IN CRYSTALLINE HYDRATES: AQUEOUS SOLUTIONS OF SIM-PLE NONELECTROLYTES. For primary bibliographic entry see Field 1B. W74-08666

WATER: A COMPREHENSIVE TREATISE. VOLUME 3. AQUEOUS SOLUTIONS OF SIMPLE ELECTROLYTES.

For primary bibliographic entry see Field 1B. W74-08667

POTENTIOSTATIC COULOMETRIC DETER-MINATION OF VANADIUM, VANADIUM-MAN-GANESE AND VANADIUM-IRON MIXTURES AND THE INFLUENCE OF CHROMIUM ON THE PROCESS,
Exeter Univ., (England), Dept. of Chemistry.

For primary bibliographic entry see Field 5A. W74-08674

BIOLOGICAL METHODS FOR THE ASSESS-MENT OF WATER QUALITY. A SYMPOSIUM PRESENTED AT THE SEVENTY-FIFTH AN-NUAL MEETING, JUNE 26-29, 1972.

American Society for Testing and Materials, Philadelphia, Pa.

or primary bibliographic entry see Field 5A. W74-08679

2L. Estuaries

PROCEEDINGS: FIRST WETLANDS CON-FERENCE, JUNE 20, 1973, Connecticut Univ., Storrs. Inst. of Water

Resources

T. Helfgott, M. W. Lefor, and W. C. Kennard. Available from the National Technical Information Service as PB-232 430; \$5.75 in paper copy, \$1.45 in microfiche. Conference held at Storrs, Connecticut. Connecticut University Institute of Water Resources Report No 21. December 1973. 199 p, 4 append, 48 ref. OWRR A-999-CONN(14).

Descriptors: *Wetlands, Protection, Hydrology Soils, *Ecosystems, Geology, Biology, *Tidal marshes, *Connecticut, Environment. Identifiers: *Inland wetlands, *Environmental policy, Delineation, Holistic view.

The conference, emphasizing inland wetlands, brought together experts in geology, hydrology, soils, water chemistry, floristic and faunistic biology with other ecosystems researchers and with social and political scientists, policy makers and interested laymen. They reviewed what is known on wetlands as well as the limitations of each approach. The general conclusion of this conference was that wetlands are a part of the larger ecosystem and that each worker had contrasting views and different definitions indicating the need for a holistic view of the environment. This would result in a comprehensive definition of wetlands which will be useful in developing policies for effective delineation and protection of such areas. (See W74-08158 thru W74-08172) W74-08157

THE CONNECTICUT TIDAL WETLANDS SUR-

Connecticut Univ., Storrs. Systematic and Evolutionary Biology Section. For primary bibliographic entry see Field 6E.

Field 2-WATER CYCLE

Group 2L—Estuaries

THE CONNECTICUT TIDAL WETLANDS SUR-VEY.

Connecticut Inland Wetlands Project. Middletown For primary bibliographic entry see Field 6E.

INI AND WETLAND SOILS.

Connecticut Agricultural Experiment Station. New Haven. For primary bibliographic entry see Field 2G.

WETLAND GEOLOGY,

Connecticut Univ., Storrs. Dept. of Geology and Geography.

In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 42-63, December 1973. 11 fig, 4 tab.

*Wetlands, *Hydrogeology, *Glaciation, Pleistocene epoch, Swamps, Marshes, Tidal marshes, Sea level, Water levels, Geology, Ecology, Environment.

The geological framework of the wetlands of Connecticut is described. In Connecticut, wetlands are a continuum from the saline areas of the coast, through the brackish estuaries and tidal flats, into the freshwater wetlands of the interior. The first wetlands were formed immediately upon deglaciation of the southeastern part of the State perhaps 15,000 or 16,000 years ago. The rest of the State was clear of ice by 12,500 years ago. None of the present coastal wetlands, however, appeared until after 7,000 years ago when rising ocean waters approached present levels. Moreover, most of those initial coastal wetlands did not begin to assume characteristics similar to what we see today until after 3,000 years ago. (See also W74-08157) (Knapp-USGS) W74-08161

INLAND WETLANDS AND GROUND WATER IN EASTERN CONNECTICUT,

Connecticut Univ., Storrs. Dept. of Geology. For primary bibliographic entry see Field 2F. W74-08162

WETLAND HYDROLOGY,

Geological Survey, Hartford, Conn. Water resources Div. J. A. Baker.

In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 84-99, December 1973. 3 fig, 2 tab.

Descriptors: *Wetlands. *Connecticut. *Hydrogeology, Marshes, Swamps, Water table, Aquifers, Till, Glacial drift, Surface-groundwater relationships.

Wetlands are defined as land areas covered with shallow water or subject to intermittent flooding and subsequent slow drainage and which, generally, are characterized by an accumulation of organic matter. Most wetlands in the northeast are areas of groundwater discharge. Wetlands, by storing flood water, may reduce peak discharge, and evapotranspiration of water from wetlands can reduce total streamflow. Wetlands in Connecticut under natural conditions are areas of groundwater discharge. Probably the primary physical hydrologic benefit of wetlands to man is the reduction of peak discharge of streams. A classification of wetlands based on this function would be of great benefit for decision making. (See also W74-08157) (Knapp-USGS) W74-08163

THE ECOLOGICAL ROLE OF INLAND WET-

Connecticut Coll., New London. Dept. of Botany. W. A. Niering.

In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 100-109, December 1973.

*Wetlands *Ecology, Descriptors: *Hydrogeology, *Connecticut, Streamflow, Water balance, Evapotranspiration, Productivity, Water pollution control, Recreation, Ecosystems.

Probably no set of ecosystems has been more ruthlessly treated as wastelands than the inland wetlands. Filling, draining, and dredging have been practiced nationwide. In Connecticut no precise data are available on wetland losses, but the toll has been severe. In addition to filling for residential and commercial developments, highway construction and solid waste disposal have all had a major impact on the freshwater wetlands of the State. Floodplains are characterized by alluvial soils and are periodically flooded. Marshes, swamps and bogs are sites usually un-derlain by silty or peaty soils where the water table is at or near the surface throughout much of the year. Marshes are dominated by soft-stemmed herbaceous plants such as cattails. Wooded swamps in Connecticut are dominated by red maple. Bogs constitute a distinctive wetland type usually characterized by evergreen trees and shrubs underlain by peat deposits. One of the most significant roles of wetlands may be their ability to remove pollutants from the water flowing through them. Further destruction of wetlands can only intensify the difficult problem of preserving a high level of environmental quality. Freshwater marshes and swamps are among the most productive biological systems. Wetlands also provide a great recreational outlet. Hunting is still an important form of recreation in Connecticut. Wetlands should be incorporated into the untouched, open spaces of every town, thus becoming a part of the commitment to open lands. (See also W74-08157) (Knapp-USGS) W74-08164

ECOLOGICAL HISTORY OF WETLANDS,

Yale Univ., New Haven, Conn. Dept. of Biology. M. B. Davis.

In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 113-122, December 1973. 2 fig.

Descriptors: *Wetlands, *Ecology, *Connecticut, *Sedimentation, Water pollution effects, Water pollution sources, Water pollution control, Environment, Path of pollutants.

Sediment accumulation is characteristic of wetlands. The chemical contents of the sediments reflect the concentrations of these same constituents in the wetland itself; and the remains of animals and plants preserved as fossils reflect numbers and kinds of organisms in the wetlands and on the surrounding landscape. In Connecticut, wetlands have had a complex history, including disturbance by the extensive agriculture of the early 19th century, recovery in some areas as farms were abandoned, and renewed pollution in recent years as the population has increased. The sedimentary record of these changes provides the documentation needed to adopt sensible protective measures. (See also W74-08157) (Knapp-W74-08165

INSECTS (CHRYSOPS FLIES) IN CONNEC-

TICUT SALT MARSHES,
Connecticut Agricultural Experiment Station, New Haven. I F Anderson

In: Proceedings of First Wetlands Conference. Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 125-132, December 1973.

Descriptors: *Wetlands, *Connecticut, *Insect behavior, Insect control, Ecology, Ecosystems, Environment. Identifiers: *Deer flies

The encroachment of man upon salt marshes and wetlands is associated with insect problems, illustrated by this study of biting flies and man in Connecticut. The marsh provides all the requisites for the maintenance of populations of deer flies. Essentially, these are suitable rendezvous sites for mating, suitable sites for the deposition of eggs, and a suitable medium for the growth and survival of the juvenile forms. The uplands near wetlands are often not only residential but also a broken woodland. The roads and sidewalks are often lined with trees as are the yards surrounding the houses. Flies rest on the foliage, and at certain times of the day they drop to lower levels when suitable hosts pass by their resting sites. The number of flies landing on man in the wooded area was significantly higher than in all other sampling sites. (See also W74-08157) (Knapp-USGS) W74-08166

LEGAL ASPECTS OF WETLANDS PROTEC-TION--LIMITS OF THE POLICE POWE For primary bibliographic entry see Field 6E. W74-08167

INLAND WETLANDS FROM THE ADMINIS-TRATORS VIEWPOINT-BASED ON EX-PERIENCES WITH CONNECTICUT'S INLAND WETLANDS AND WATER COURSES ACT, Connecticut Dept. of Environmental Protection,

For primary bibliographic entry see Field 6E. W74-08168

THE SOIL CONSERVATION AND ITS ROLE IN WETLAND MANAGEMENT FOR CONNEC-

Soil Conservation Service, Storrs, Conn. For primary bibliographic entry see Field 6E. W74-08169

FEDERAL POLICY TOWARDS WETLANDS, Environmental Protection Agency, Edison, N.J. Federal Water Programs. For primary bibliographic entry see Field 5G. W74-08170

INDUSTRIAL ASPECTS OF WETLAND USES, Northeast Utilities Service Co., Hartford, Conn. Environmental Planning Coordination. For primary bibliographic entry see Field 6E. W74-08171

PANEL REVIEW AND COMMENTARY, Connecticut Univ., Storrs. Inst. of Water For primary bibliographic entry see Field 6E. W74-08172

PARAMETRIC STUDY OF WATER RESOURCE VARIABLES IN A DELTA REGION OF SOUTH LOUISIANA...BAYOU LAFOURCHE VOLUME I - TECHNICAL DISCUSSION, VOLUME II - APPENDICES, Louisiana State Univ., Baton Rouge. Div. of Engineering Research. For primary bibliographic entry see Field 5B. W74-08289

PREDICTING REAERATION COEFFICIENTS FOR POLLUTED ESTUARY,

New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility. For primary bibliographic entry see Field 5B. W74-08307

USER'S GUIDE TO NODC'S DATA SERVICES. National Oceanographic Data Center, Washing-For primary bibliographic entry see Field 10A.

DEFINITION OF CRITICAL COASTAL AREAS AND APPROACHES TO STANDARDS FOR MANAGEMENT, South Carolina Wildlife and Marine Resources

E. A. Laurent, R. R. Wilkinson, T. E. Lewis, and E. L. Cheatum.

Report of the Governor's Conference on Marine Resources, p 15-25, December 17, 18, 1973, Char-leston, South Carolina. 11 p, 2 tab.

Descriptors: *Coastal marshes, *Coasts, *Coastal engineering, *Zoning, *Land use, Planning, Standards, State governments, Natural resources, Water utilization, Economic feasibility, Optimum development plans, Environmental effects, Environmental control, Social values, Legal aspects, Regulation.
Identifiers: *Coastal zone management.

Coastal zone management deals with a set of resources whose total quantity is relatively fixed resources whose total quantity is relatively fixed and whose overall quality for many uses is generally eroding. The critical areas concept is much like a zoning or taxing policy, that has been put forward to supercede the market system in allocating coastal resources. In essence, the critical area concept attempts, by allocating to the state strong management powers over a given area, to internalize the diseconomies arising from the use of that area. In other words, the role of critical areas in coastal zone management is to provide for present and anticipated demands that are not reflected adequately in the market system. General considerations in establishing criteria for designating critical areas do exist. A critical area should meet an obvious public need and should aid in avoiding the conflicts that presently plague coastal areas. The criteria should include the economic, social and environmental impacts of the decision, and should also consider the reversibility of a particular use of the coastal zone. Standards which should be employed in management of such critical areas are suggested. (Ritchie-Florida) W74-08532

LOUISIANA MOVES TOWARD COASTAL ZONE MANAGEMENT.

Louisiana State Univ., Baton Rouge. Sea Grant For primary bibliographic entry see Field 6E. W74-08537

FINAL REPORT ANALYZING COASTAL AND MARINE LAW TO DEVELOP AN AUTHORITY FOR COASTAL ZONE MANAGEMENT,

Texas Law Inst. of Coastal and Marine Resources,

For primary bibliographic entry see Field 6E. W74-08544

DISTRIBUTION OF FLUORIDE IN WATERS OF

Nagoya Univ. (Japan). Water Research Lab. For primary bibliographic entry see Field 5B. W74-08549

COASTAL ZONE MANAGEMENT ACT OF

For primary bibliographic entry see Field 6E.

W74-08581

RICHARDSON BAY EFFLUENT DILUTION STUDY-A WORKING PAPER. Environmental Protection Agency, San Francisco,

Calif. Region IX. For primary bibliographic entry see Field 5B. W74-08604

BACTERIAL DEGRADATION OF PETROLEUM MATERIALS IN LOW MARINE ENVIRONMENTS,

Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology. For primary bibliographic entry see Field 5B. W74-08626

HYDROCARBON ALASKAN WATERS, BIODEGRADATION

Alaska Univ., College. Inst. of Marine Sciences. For primary bibliographic entry see Field 5B. W74-08627

MICROBIAL ECOLOGY AND THE PROBLEM OF PETROLEUM DEGRADATION IN CHES-

Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.

HYDROCARBONS OF SUSPECTED POLLU-TANT ORIGIN IN AQUATIC ORGANISMS OF SAN FRANCISCO BAY: METHODS AND PRELIMINARY RESULTS,

California Univ., Berkeley. Naval Biomedical For primary bibliographic entry see Field 5B. W74-08630

THE IMPACT OF OIL ON MARSHLAND MICROBIAL ECOSYSTEMS,

Louisana State Univ., Baton Rouge. Dept. of Food Science. For primary bibliographic entry see Field 5C. W74-08631

THE RELATIVE CHANGES IN N-ALKANE COMPOSITION IN SURFACE WATER SLICKS, Florida State Univ., Tallahassee. Dept. of Oceanography.

For primary bibliographic entry see Field 5B. W74-08633

MICRORES ESTUARINE ESTUARINE MICROBES AND GANOCHLORINE PESTICIDES (A BRIEF

REVIEW), Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab. For primary bibliographic entry see Field 5B. W74-08634

COASTAL ECOSYSTEMS, ECOLOGICAL CONSIDERATIONS FOR MANAGEMENT OF THE COASTAL ZONE,

Conservation Foundation, Washington, D.C.

Available from The Conservation Foundation, Publications Dept. 1717 Massachusetts Ave, N.W., Washington, DC 20036, \$4.00 paper copy. Coastal Ecosystems. Ecological Considerations for Management of the Coastal Zone, March 1974. 191 p, 80 fig, 10 tab, 126 ref. NOAA-04-3-158-68.

Descriptors: *Ecosystems, Coasts, Estuaries, *Ecology, *Land use, *Conservation, *Management, *Environmental effects, Environment, Resource development, Aquatic plants, Aquatic animals, Water quality, Water pollution, Resources, Shore protection. Identifiers: Environmental impact, Coastal waters. Shorelands, *Coastal ecosystems.

Environmental management of coastal waters and shorelands has as one of its fundamental goals the maintenance of coastal ecosystems in their best condition, or at the level of best achievable ecosystem function, which usually means as near to the natural condition as possible. Whatever its specific goals may be an environmental management program must embrace whole ecosystems. Any attempt to manage separately one of the many interdependent components of a complex ecosystem will very likely fail. So would any attempt to control any one source of environmental disturbance to the system without controlling others. The ecosystem defined must embrace a complete and integral unit, one that includes a coastal water basin (or basins) and the adjacent shorelands to the extent they have significant influence on coastal waters. Development adjacent to estuarine waters will require exceptionally vigorous management attention. For this reason we have given a higher degree of attention to estuaries than to ocean water areas. Many of the principles applying to marine estuaries will be found to apply to the ecosystems of the Great Lakes, not specifically addressed here. (Sinha-OFIS) W74-08642

DIFFICULTIES AHEAD FOR OREGON REGARDING ESTUARY REGULATIONS, CONTROL AND PROTECTION,

Oregon State Dept. of Environmental Quality, Portland.

L. B. Day

In: Proceedings 2nd Annual Technical Conference on Estuaries on the Pacific Northwest, March 16-17, 1972, Oregon State Univ., Corvallis (Engineering Experiment Station Circular No. 44),

*Comprehensive planning, Decision making, Environment, Zoning, Coasts, Management. Identifiers: Coastal zone. Descriptors: *Estuaries,

Estuaries and coastal zones represent one of a country's most valuable resources. Their many uses which include navigation, water supply, waste discharge, and fisheries, may lead to an ex-cessive exploitation. Regional planning, however, does not necessarily mean that the resultant area does not necessarily mean that the resultant are development will be based on sound ecological planning. Indeed, land use plans can actually abuse the environment. What is needed is a con-servation plan which seeks to protect the produc-tivity and fragility of land through an explicit con-sideration of the ecological, biological, and physi-cal capacities and limitation of the natural system. cal capacities and limitation of the natural system. Experiences in regional planning in Yaquina Bay, Oregon are utilized to provide an example of com-prehensive planning. The Bay faced a myriad of problems typically found in estuaries. On the recommendations of the governor's office, the county commissioners created the Yaquina Bay Task Force. As a result of detailed studies, the Task Force developed a comprehensive plan which covered water, sewer, and land use. In 1971 the plan was codified through a zoning ordinance. A second benefit arising from the planning process is the increased public awareness generated. Once the plan was developed, local people recognized that their interests were being protected not encroached upon. (See also W74-07491) (Schroeder-Wisconsin) W74-08670

THE NATIONAL SHORELINE STUDY.

Corps of Engineers, Portland, Oreg. H. D. Herndon.

In: Proceedings 2nd Annual Technical Conference on Estuaries on the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No. 44), p 55-58, 1 fig.

Field 2-WATER CYCLE

Group 2L—Estuaries

Descriptors: *Erosion, *Seashores, *Shore protection, Beach erosion, Federal government, Erosion control, Public lands, Washington, Oregon, Management, Estuaries, Costs, Sands, Dunes, Pacific Northwest U.S.

The recently completed National Shoreline Study is discussed and its findings for the Pacific Northwest examined. The study can be broken down into three categories: shore erosion inventories; shore protection plans; and shore management guidelines. It indicates where erosion occurs, what remedial actions may be involved and their respective costs; and location and ranking urgent problem areas. In the third category, the type of assistance that is provided to state and local authorities to create and implement coast and shoreline programs, guidelines are suggested for the creation of land-use regulation in coastal areas and coastal areas where little uncertainty exists are identified. The regional inventory of Oregon reveals that 165.5 miles of ocean and estuarine shorelines experience erosion problems; 58.5 miles of ocean shoreline and 5.5 miles estuarine shorelines experience sufficient difficulties to require remedial action. For Washington 77.5 miles of ocean shoreline and 29 miles of estuarine shoreline are experiencing erosion problems, with 2.5 and 5 miles respectively requiring remedial actions. Three areas in Oregon--Clatsop Spit at the mouth of the Columbia River, Bayocean Peninsula at Tillamook Bay, and the mouth of Siuslaw River were found to require remedial action to maintain navigation. (See also W74-07491) (Schroeder-Wisconsin) W74-08671

TECHNICAL AND ECONOMIC ISSUES IN THE WATER QUALITY MANAGEMENT YAQUINA BAY,

Oregon State Univ., Corvallis. Dept. of Agricultural Economics.

H. H. Stoevener, J. B. Stevens, and H. F. Horton. In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 93-108, 6 fig, 11 tab, 10 ref. WP-00107. Sea Grant 2-35187.

Descriptors: *Decision making, *Input-output Descriptors: "Pecision making, "input-output analysis, "Waste disposal, "Economic impact, Methodology, Value, Industries, Sport fishing, Pulp wastes, Estuaries, Water pollution control, Aesthetics, "Oregon. Identifiers: Yaquina Bay(Ore), Transfer costs.

A methodology which identifies alternative pollution control measures and their impacts on the economic and environmental base of a region is suggested and its data requirements utilized Yaquina Bay, Oregon as the empirical setting. The economic base of the region centers around tour ism, commercial and recreational fishing, and timber products production. Environmental concerns in the Bay during the late 1950's, the subject matter of this study, centered on the potential impact of effluent from a proposed Kraft mill (KME). The study initially assumes that the bay is free of pollution and evaluates the direct and in-direct benefits arising from the recreational resources. Alternative KME disposal methods were then evaluated by engineers. Assuming that the effluent would be disposed through dilution, biologists predicted the loss of economic organ-isms. The economists converted these loss func-tions into economic losses based on human responses to a fishing success-effort relationship.
Using this approach the best disposal method could then be determined. Conclusions were drawn as to the ability of the decision maker to implement pollution arrangements through existing institutional arrangements. (See also W74-07491) (Schroeder-Wisconsin)

THE BRACKISH WATER CLAM RANGIA CU-NEATA AS INDICATOR OF ECOLOGICAL EF-FECTS OF SALINITY CHANGES IN COASTAL

Texas A and M Univ., College Station. Dept. of Biology. For primary bibliographic entry see Field 5C.

W74-08676

RESEARCH TO DETERMINE THE ENVIRON-MENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES.

Skidway Inst. of Oceanography, Savannah, Ga. For primary bibliographic entry see Field 5C. W74-08677

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

REVERSE OSMOSIS AND ULTRAFILTRATION - A SURVEY OF AUXILIARY APPARATUSES AVAILABLE IN THIS FIELD (UMGEKEHRTE OSMOSE UND ULTRAFILTRATION - EIN UEBERBLICK UEBER DIE AUF DIESEM GEBIET VERFUEGBAREN APPARATIVEN

HILFSMITTEL),
Alfa-Laval A.B., Tumba (Sweden).
For primary bibliographic entry see Field 5D. W74-08218

MANUAL FOR CALCULATION OF CONVEN-TIONAL WATER TREATMENT COSTS, Control Systems Research, Inc., Arlington, Va.

I.C. Watson.

Available from the National Technical Information Service as PB-226 791/AS; \$3.75 in paper copy, \$1.45 in microfiche. Office of Saline Water Report INT-OSW-RDPR-74-917, March 1972. 77 p, 58 fig, 10 tab, 18 ref. (Prepared for Montana Water Resources Board). OSW Contract 14-01-0001-2727

Descriptors: *Water treatment, *Water costs, *Municipal *Desalination plants. water. *Montana, Waste water treatment, Softening, Iron, Activated carbon, Filtration, Coagulation, Chlorination, Feasibility studies. Identifiers: *Water treatment costs, Iron removal.

The report is based on supplemental work done in connection with the OSW sponsored study on the Feasibility of Desalting Municipal Water Supplies in Montana - OSW R and D Report No. 783. It pro-vided the necessary basis for estimating the cost of conventional water supplies which was needed for realistic comparison with the cost of desalting. The report updates and provides additions to the cost estimating information found in OSW R and D Reestimating information found in OSW R and D Re-port No. 257 (Desalting Cost Calculating Procedures, May 1970) and No. 555 (Manual of Procedures and Methods for Calculating Com-parative Costs of Municipal Water Supply from Saline and Conventional Water Sources in Texas, November 1966). It is intended for municipal rather than industrial applications. Water treatrather than industrial applications. Water treatments for which cost estimates are given include: (1) Coagulation, sedimentation and filtration; (2) Softening by lime-soda; (3) Iron and manganese; (4) Activated carbon; (5) Chlorination; (6) Defluoridation; (7) Microstraining. (OSW) W74-08333

REVERSE OSMOSIS MEMBRANE FILTERS FOR SEAWATER PRETREATMENT,

General Atomic Co., San Diego, Calif. G. E. Foreman, and S. S. Kremen.

Available from the National Technical Informa-tion Service as PB-227 802/AS; \$5.75 in paper

copy, \$1.45 in microfiche. Office of Water, Report INT-OSW-RDPR-74-926, February 1974. 47 p, 13 fig, 10 tab, 4 ref. OSW Contract 14-30-3094.

Descriptors: *Demineralization, *Desalination, *Membrane processes, Pilot plants, *Reverse osmosis, *Sea water, Filters, Economic feasibility, *Feasibility studies, *California.

Identifiers: Spiral-wound elements, Cellulose acetate, Economic analysis, Pretreatment(Sea water), San Diego(Calif).

The objective was to establish the technical and economic feasibility of two-stage seawater systems utilizing low pressure spiral elements in a combined pretreatment/first-stage desalting step. Spiral-wound elements containing selected membranes were fabricated and tested on San Diego Bay water, and the effectiveness of low-pressure pretreatment elements was evaluated by testing high-pressure spiral elements. Low pressure ele-ments provided nominal water fluxes of 13 gal/ft2-day with negligible salt rejection at 50 to 180 psi, 20% rejection at 250 psi, and 50% rejection at 500 psi. These elements responded well to the chemipsi. I nese elements responded well to the chemical flushing techniques used during testing. Economic analysis based on a plant having a size in the million gallon per day scale indicated that potable water could be obtained from seawater at an initial cost ranging between \$1.25 and \$1.50/1000 gallons. (OSW)

BRACKISH WATER DESALTING, TESTING AND EVALUATION PROCEDURES WITH MO-BILE TEST FACILITY,

BILE TEST FACILITY, Burns and Roe Construction Corp., Paramus, N.J. E. Ewoldsen, and P. M. Mothes. Available from the National Technical Informa-tion Service as PB-227 451/AS; \$11.75 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-921, January 1974. 160 p, 63 fig, 29 tab. OSW Contract 14-30-2858.

*Desalination Descriptors: Desalination. processes, Membrane processes, "Membranes, Pilot plants, Reverse osmosis, Saline water, Elec-trodialysis, Ion transport, "Arizona, "Brackish water, Testing, "Test wells, Water treatment. Identifiers: Hollow fine fibers, Formamide mem-

branes, Cation and anion membranes, Spiral wound membranes, Tubular membranes, Pretreatment methods, Cellulose triacetate membranes, DuPont Permeator, Gila Valley(Ariz), Pretreat-

A mobile brackish water test facility was operated at Well No. 8 in the South Gila Valley approximately 5 miles from Yuma, Arizona. The tests conducted were part of a continuing program to evaluate the performance of current membrane hardware on brackish water and determine those parameters necessary for design of larger plants. Pretreatment procedures consisted of sand filtration, iron and manganese removal, carbon filtra-tion, lime and lime soda softening, acidification for pH control, and the use of polishing filters. Three types of reverse osmosis modules were evaluated at 60% and 85% recoveries, viz., tubular turbulence promotors, tubular without turbulence promotors and spiral wound elements. Three hollow fine fiber modules were also evaluated. In addition, an Ionics Model 124C electrodialysis unit was tested. (OSW) W74-08335

DEVELOPMENT OF HIGH-PRESSURE SPIRAL MEMBRANE ELEMENTS FOR SEAWATER DESALINATION,

Gulf Environmental Systems Co., San Diego,

F. K. Lesan, and R. B. Stackhouse Available from the National Technical Informa-tion Service as PB-228 061/AS; \$4.00 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-73-879, September 1973. 80 p, 37 fig. OSW Contract 14-30-2980.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Saline Water Conversion—Group 3A

Descriptors: Desalination, *Desalination processes, *Reverse osmosis, *Pilot plants, *Desalination *Membrane processes, Desalination plants, *Sea water, *California.

Identifiers: Spiral wound modules, High pressure, Cellulose acetate membranes, Brine spacer materials, Tributary configuration, San Diego(Calif).

An 8 inch diameter spiral wound reverse osmosis module element and module, capable of sustained operation at 1000 psi and designed for use in the first pass of two pass reverse osmosis seawater desalting plant, was fabricated and field tested. Each of the elements contain 180 ft2 of active membrane area with the membranes fabricated through use of an Eastman 400-25 cellulose acetate and acetone/formamide system. During field evaluation testing of this module at the OSW San Diego Test Facility for desalting natural seawater, membrane performance was about 30% less than the target goal of 12 gfd producing 3000 ppm TDS or better product water. The unexpectedly low flux experienced was attributable to a lack of sufficient experience and data for very-high salinity feeds. The results should form a strong basis for ruture work in improving high-salinity membrane performance. (OSW) W74-08336

ECONOMIC OPTIMIZATION OF THE AVCO CRYSTALLIZATION PROCESS, AVCO Systems Div., Wilmington, Mass. J. H. Fraser, and T. A. Olsson.

Available from the National Technical Information Service as PB-226 918/AS, \$4.75 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74,916, 114 p, 27 fig, 9 tab, 18 ref. OSW Contract 14-30-2989.

*Desalination, *Crystallization, Economic efficiency, Freezing, Parametric hydrology, *Sea water, Brackish water, *Capital costs, Operating costs, Water

An economic optimization and parametric study has been conducted on a new crystallization process for water desalination. Results indicate that this process should desalinate seawater at a cost which is significantly lower than the costs reported for competitive processes. The process does not require pretreatment of the feed water for most applications. For capacities up to 1 mgd of product, the process equipment can be mounted in automated compact units which reduces field erection costs. Low capital cost is achieved by the use of compact crystallizers, pressurized wash columns and inexpensive materials of construction. The latter is possible due to the low operating temperature of freezing processes. Ontimum values of heat transfer surface areas and yield were calculated for minimum water cost. A parametric study of the effects of feed salinity (0.5 to 3.5 percent), feed water temperature (60 to 80F), power cost (0.50 to 1.3 cents/kwhr), fixed charge rate (7 to 13 percent) and plant factor (90 percent) indicated estimated water costs ranging from \$0.53 to \$1.08 per 1,000 gallons of product water for 1 mgd plants, and installed costs (within the plant boundary) ranging from \$0.82 to \$0.96 per gallon of daily capacity. In 0.1 mgd plants, the estimated water costs range from \$1.64 to \$2.54 per 1,000 gallons of product water, and the installed costs range from \$2.38 to \$2.58 per gallon of daily capacity. (OSW) W74-08337

DEVELOPMENT OF LARGE SPIRAL MEM-BRANE REVERSE OSMOSIS ELEMENTS FOR LOW-COST WATER PURIFICATION AND RECLAMATION,

Gulf General Atomic Co., San Diego, Calif. J. M. Chirrick, G. E. Foreman, A. B. Riedinger, Available from the National Technical Information Service as PB-226 023, \$4.50 in paper copy, \$1.45 in microfiche. Office of Saline Water Report INT-OSW-RDPR-73-901, November, 1973, 115 p. 42 fig, 28 tab, 5 ref. OSW Contract 14-30-3074.

*Desalination, Descriptors: processes, Membrane processes, *Membranes, Osmosis, *Pilot plants, Saline water, Brackish water, *Reverse osmosis, *Water purification. Identifiers: Spiral-wound modules, Cellulose acetate membranes.

The objective was to develop a spiral-wound reverse osmosis element, measuring 12 inches in diameter and 36 inches long, for low cost reclamation and purification of low-salinity waters. The results demonstrated the feasibility of a reverse osmosis module measuring 12 inches in diameter and 30 feet in length to produce 100,000 gpd of pu-rified water. (OSW) W74-08338

BRACKISH WATER DESALTING TESTING AND FIELD EVALUATION WITH REVERSE OSMOSIS AND ELECTRODIALYSIS PILOT

Burns and Roe Construction Corp., Paramus, N.J. E. G. Kaup.

Available from the National Technical Information Service as PB-225 189; \$11.25 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-73-899, November 1973, 150 p, 61 fig, 25 tab. OSW Contract 14-01-0001-2245.

Descriptors: *Desalination, Desalination processes, *Electrodialysis, Membrane processes, *Pilot plants, *Reverse osmosis, *New Mexico, Brackish water, *Membranes.

Identifiers: Tubular membranes, Spiral wound membranes, Hollow fine fiber membranes, membranes, Ho Roswell(N. Mex).

The report covers work performed during the period July 1969 through June 1971, at the Roswell Test Facility, Roswell, N.M. The Contractor furnished technical and operating personnel to conduct field test evaluation of reverse osmosis and electrodialysis membrane desalting pilot plants. Data are reported on the evaluation of various manufacturers tubular units, spiral wound units, and hollow fine fiber units. A 5000 gpd electrodialysis pilot plant was also tested. The performance characteristics of each unit is summarized. The tests were run using 2000 and 5000 ppm salinity feed waters at ambient temperatures. (OSW) W74-08339

OF ION EVALUATION FXCHANGE PROCESSES FOR TREATMENT OF MINE DRAINAGE WATERS,

Burns and Roe, Inc., Paramus, N.J. For primary bibliographic entry see Field 5D. W74-08341

DEVELOPMENT OF A ONE-PASS HOLLOW FIBER SEAWATER DESALINATION MODULE HAVING A CAPACITY OF 2500-3000 GPD, Dow Chemical Co., Walnut Creek, Calif.

R. D. Ammons, and H. I. Mahon.

Available from the National Technical Informa-tion Service as PB-227 089/AS; \$6.50 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-924, January 1974, 60 p, 18 fig, 18 tab. OSW Contract 14-30-2972.

Descriptors: *Membrane processes, *Desalination processes, Desalination, *Reverse osmosis, Water treatment, Pilot plants, *Sea water. Identifiers: Hollow fine fiber modules, Cellulose

triacetate membranes.

Cellulose triacetate hollow fiber reverse osmosis modules were developed for single-pass desalting of seawater based on scale-up in module size and capacity from a 4-inch diameter, 100 gpd unit to an 8-inch diameter module with a target capacity of 2500 gpd. Seven of the 8-inch diameter hollow god. Seven of the shich danketer holow fiber cartridges were fabricated. Four of these units were field tested on seawater at the San Francisco Aquarium and at the OSW Test Facility at San Diego. Three of the modules produced potable water (i.e. less than 500 ppm TDS) in a single pass desalting seawater at 700 or 800 psig operating pressure and at recoveries ranging from 10 to 25%. The longest field test of a module producing potable water was 2000 hours. Module producitivi ties in the field tests were lower than projected because fiber fluxes were low. The highest productivity in the Aquarium tests was 2200 gpd and at San Diego, 1650 gpd. Differences in productivity at the two test sites corresponded to the calculated driving forces and reflected differences in feed water salinity and, in some cases, in operating pressure. (OSW) W74-08342

DESIGN AND CONSTRUCTION OF A LARGE BRACKISH WATER DESALINATION MODULE,

NODULE,
Dow Chemical Co., Walnut Creek, Calif.
H. I. Mahon, and M. D. Bearden.
Available from the National Technical Information Service as PB-227 177/AS; 88.75 in paper copy, \$1.45 in microfiche. Office of Saline Water. Report INT-OSW-RDPR-74-923, January 1 102 p, 45 fig, 23 tab. OSW Contract 14-30-2861.

Descriptors: *Membrane processes, *Desalination processes, Desalination, *Reverse osmosis, Water treatment, Pilot plants, *Brackish water, *New Mexico.

Identifiers: Hollow fine fiber modules, Cellulose triacetate membranes, Roswell(N. Mex).

A 30,000 GPD cellulose triacetate hollow fiber reverse osmosis module, for potential use in large-scale brackish water desalting plants, was designed and fabricated. The design selected for final development was based on a two-cartridge canister module utilizing a pressure case, 12 inches in diameter by 10 ft. long. A reverse osmosis test system was also designed and fabricated for shop and field testing of the 30,000 GPD module. The module was subjected to a 60-day continuous field evaluation test at the OSW Test Facility, Roswell, New Mexico on a 3650 ppm TDS brackish feed-water. The purpose of this test was to measure module performance stability at 600 psig operating pressure at the recovery selected to give maximum productivity. Target goals of 30,000 GPD productivity and 90% rejection were exceeded. However, conservative design of the pressure case resulted in lower than target productivity per cubic foot of module volume. Capital and operating cost esti-mates were also made for large brackish water desalting plants using the 30,000 GPD cellulose triacetate hollow fiber reverse osmosis modules. W74-08343

DEVELOPMENT OF A REVERSE OSMOSIS MODULE FOR WASH WATER RECYCLING IN

A SPACE ENVIRONMENT AT 165 DEG F, Environgenics Systems Co., El Monte, Calif. For primary bibliographic entry see Field 5D. W74-08344

FIELD TEST EVALUATION OF THE HIGH TEMPERATURE ELE PROCESS AT WEBSTER, S.D., Ionics, Inc., Watertown, Mass. ELECTRODIALYSIS

Ionics, Inc., Watertown, Jass. R. G. Parent, and J. W. Arnold.
Available from the National Technical Information Service as PB-226 673/AS; \$6.25 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-900, January 1974. 71

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3A—Saline Water Conversion

p, 20 fig, 21 tab, 2 ref. OSW Contract 14-01-001-2101.

Descriptors: *Demineralization, *Desalination plants, *Electrodialysis, Ion transport, Membrane processes, Membranes, Scaling, Pilot plants, Cost analysis

Identifiers: *Brackish water, Pretreatment, Stack sliming, Intermembrane spacers, Hi-Temp Stackpack

The Ionics 10,000 GPD unit was operated at 100F for a total of 5000 hours. The feed water was converted from a salinity of 1200 ppm to a product salinity of 350 ppm at a 90.5% current efficiency and at an average operating current density equal 70% of the limiting current density value. The D.C. power for this degree of desalting was about 1.5 KWH/1000 gal. Preliminary economics based on the 10,000 GPD pilot unit projected for a 1 MGD facility indicates that the total water costs for operation at 100F would be approximately 90% of the total water costs for equivalent operating performance at a temperature of 50F, provided heat recovery from the blowdown stream is practiced. The value of turbulence promoters at higher temperatures (above 140F) and at higher velocities (above 40 cm/sec) was marginal. (OSW)

FEASIBILITY STUDY ON DESALTING BRACKISH WATER FROM THE MT. SIMON AQUIFER IN NORTHEASTERN ILLINOIS.

Illinois State Water Survey, Urbana. Available from the National Technical Informa-Total tion the National Technical Information Service as PB-230 755/AS \$9.50 in paper copy, \$1.45 in microfiche. Report INT-OSW-RDPR-74-938, 1973. 120 p, 45 fig, 30 tab, 52 ref. OSW Constract 14-30-2924.

Descriptors: *Desalination, *Artesian aquifers, Sand aquifers, Computer models, Water costs, Conjunctive use, *Feasibility studies, *Illinois, *Water supply, Sandstones, Dissolved solids, Minerals, Water wells, Injection wells, *Brachish

Identifiers: Mt. Simon Aquifer(Ill), Chicago(Ill), *Saline water, Aquifer.

The feasibility of desalting saline waters stored in a deep artesian aquifer, the Mt. Simon sandstone in northeastern Illinois, was determined as an aid in meeting projected water deficits in the Chicago region. The aquifer is from 1200 to 2800 feet thick. The total dissolved minerals (TDM) increase gradually with depth from less than 500 mg/l to almost 90,000 mg/l at the bottom of the aquifer. Predictions of the mineral quality of feedwater withdrawn from wells were simulated by digital computer analysis as an aid in desalting plant design. Analysis indicated that feedwater mineral concentration increases non-linearly with time of pumping complicating system design. Important feedwater characteristics for desalting plant design are its high hardness and high concentrations of iron and TDM. Injection of waste brines to the lower part of the aquifer was selected as the most practical disposal method. The reverse osmosis and freezing processes were considered feasi-ble for 1 million gallons per day (mgd) plants. Costs, including wells, transmission lines, desalting plants, and brine disposal, ranged from 133 cents/1000 gal for the 1 mgd reverse osmosis plant to 185 cents/1000 gal for the 5 mgd distillation plant. Costs are much lower (74 cents/1000 gal in one area) when used in conjunction with available proundwater. (OSW) W74-08499

BRINE CONCENTRATION BY ELECTRODIAL-

PRINE CONCENTRATION BY ELECTRODIAL-YSIS, PHASE I, Dow Chemical Co., Freeport, Tex. Texas Div. D. R. Jordan, T. Miyake, and W. F. McIlhenny. Available from the National Technical Informa-tion Service as PB-229 128/AS, \$5.00 in paper copy, \$1.45 in microfiche. Office of Saline Water

Report INT-OSW-RDPR-74-930, March 1974, 145 p, 31 fig, 21 tab, 12 ref. OSW Contract 14-30-2676.

Descriptors: *Desalination, *Membrane processes, Descaling, Membranes, Pilot plants, Saline water, Brines, *Brines Pilot plants, disposal, Sealing, Ion exchange

Identifiers: Ion exchange memebranes, Cost esti-

A summary is presented of the development of brine concentration from sea water by electrodialysis. A single stage pilot plant using commercial size electrodialyzer components in a sixty cell pair stack was designed and constructed. The pilot plant was successfully operated to produce brine concentrations in excess of 20 wt-% with high chloride, high sulfate, and mixed chloride-sulfate feed waters. The maximum brine concentration achieved was 25 wt-% with the chloride-sulfate solubility limit in the vicinity of 22 wt-%. The effect of membrane scaling was studied. Calcium carbonate was eliminated by adjusting brine pH to 6.5. Gypsum deposition under operating conditions was studied with and without sodium hexametaphosphate injection to the recirculated concentration stream. The gypsum saturation level, based on the bulk stream concentration of calcium and sulfate was found to be 0.0105 equiv. 2/liter2 in the high chloride brine. The cost of product water was 27 - 32 cents per 1000 gallons. (See also W74-08501) (OSW) W74-08500

BRINE CONCENTRATION BY ELECTRODIAL-YSIS, PHASE II,

Dow Chemical Co., Midland, Mich. D. R. Jordan, M. D. Bearden, R. Komori, and W. F. McIlhenny.

Available from the National Technical Informa-Available from the National Technical Informa-tion Service as PB-229 629/AS, \$5.75 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-931, March 1974. 205 p, 30 fig, 34 tab. OSW Contract 14-30-3031.

Descriptors: *Desalination. *Reverse osmosis. Electrodialysis, Pilot plants, Descaing, Ion exchange, *Membrane processes, Membranes, Brackish water, Gypsum, Brines.

Identifiers: Hollow fine fibers, Spiral-wound membranes, SV-3 electrodialyzer, Ion exchange membranes, Cation exchange. Resins, Sodium hexametaphosphate.

A summary is presented of work to determine the feasibility of concentrating waste brines by electrodialysis (ED) and the beneficial effect of combining reverse osmosis (RO) and ED in a single high recovery desalting system. Laboratory and pilot scale runs were made using a GESCO spiralwound RO unit and a Dow hollow fine fiber RO unit with the existing Asahi sv-1/2 ED brine concentrator at the Roswell Test Facility. The combined RO-ED system was demonstrated by a 7week stable operation at a total capacity of 20,000 gpd of product water, a recovery of greater than 90% using 3960 ppm Roswell blended water. A systems analysis of complete water plants incorporating the combined RO-ED system was made. The effect of operating parameters on the cost of water was investigated by computer simulation of three specific test sites. The use of sodium herametaphosphate at a level of 100 ppm allowed operation at 350% of equilibrium saturation in chloride/sulfate waters and nearly 200% in high sulfate waters. (See also W74-08500) (OSW) W74-08501

HIGH REJECTION HOLLOW FIBER MEM-BRANES FOR DESALINATION OF WATER.

Dow Chemical Co., Walnut Creek, Calif. E. L. Dance, T. E. Davis, and H. I. Mahon. Available from the National Technical Informa-tion Service as PB-226 735/AS, \$5.75, in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-922, January 1974, 69 p, 29 fig, 10 tab. OSW Contract 14-30-2799

Descriptors: *Membrane processes, *Desalination processes, Desalination, *Reverse osmosis, Water treatment, Pilot plants, *Sea water, California,

Identifiers: Hollow fine fiber modules, Cellulose triacetate membranes.

Small scale, 100 gpd, reverse osmosis modules using cellulose triacetate hollow fiber membranes were developed for single-stage desalination of seawater. The modules were tested in a oncethrough system for periods of up to 3600 hours. All the modules produced potable water in a singlestage from seawater with 98.9% to 99.9% salt restage from seawater with 98.9% to 99.9% sait rejection efficiency. The hollow fiber membrane flux varied from 0.4 to 1.1 gfd at test pressures of 800, 900, and 1000 psig and at recoveries ranging from 15 to 59%. Eight 100 gpd cartridges were tested on seawater at the Steinhart Aquarium in San Francisco, California. The small experimental cartridges were designed for radial flow of the seawater over the outer surface of the fibers. Fiber dimensions were: inside diameter 30 microns and outside diameter 82 to 105 microns. The active length of individual fibers in the cartridges was approximately 7 inches. Design studies were also made of field scale modules with capacities in the range of 3,000 to 4000 gpd. (OSW) W74-08502

DEVELOPMENT OF A PRODUCTION TECHNIQUE FOR POROUS STAINLESS STEEL TUBES,

Universal Oil Products Co., Dearborn Heights, Mich. Wolverine Tube Div. For primary bibliographic entry see Field 8G. W74-08503

FORMED CONDENSATION IN-SITU POLYMERS FOR REVERSE OSMOSIS MEM-RDANES

North Star Research and Development Inst., Minneapolis, Minn. J. E. Cadotte, and L. T. Rozelle.

Available from the National Technical Informa-tion Service as PB-229 337/AS, \$5.00 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-927, November, 1972. 32 p, 8 fig, 11 tab, 4 ref. OSW Contract 14-

Descriptors: *Reverse osmosis, *Membranes, membranes, *Semipermeable membranes, *
*Desalination. membranes Seawater, Demineralization, Thin films, Pressure, Fouling, Polymers

Identifiers: Condensation polymers, In situ-cast

A significant new nonpolysaccharide membrane has been developed for single stage seawater desalination by reverse osmosis. Designated NS-1, it consists of a polyethylenimine-coated microporous support (polysulfone) reacted with m-tolylene 2,4-disocyanate fabricated in four steps: (1) preparation of the polysulfone support film; (2) coating of the polyethylenimine (PEI) on the polysulfone support; (3) reaction of the PEIcoated polysulfone support with tolylene diso-cyanate (TDI); and (4) heat curing of the resulting composite membrane. The desalination barrier is believed to consist of PEI crosslined with TDI at the PEI surface. Important requirements included a PEI concentration of two percent in the aqueous coating bath and a TDI concentration of 0.5 percoating bath and a 1DF concentration of 0.3 per cent (in hexane) in the reacting solution. The fabri-cation procedure required only ambient tempera-tures (except for heat curing) and pressures. The current improved NS-1 membrane has exhibited an average product water flux of 24 plus or minus 1 gfd at 99.5 plus or minus 2 percent rejection under seawater conditions in flat cells (3.5 percent synthetic seawater feed, 1500 psi, 25C). Extended term tests (800 hours) showed a low flux decline (primarily due to iron oxide fouling). The NS-1 membrane was not degraded and operated without a significant decline in reverse osmosis per-formance at pH's up to 12; at pH's below 2 the salt rejection dropped sharply. The rejection of urea by this new membrane was high (up to 85 percent at 1500 psi using 1000 ppm urea feed). (OSW) W74-08504

3B. Water Yield Improvement

FOG MODIFICATION--A TECHNOLOGY AS-

SESSMENT,
Air Force Cambridge Research Labs., Bedford, Mass

Mass.

B. A. Silverman, and A. I. Weinstein.

Available from NTIS, Springfield, Va. 22151 as

AD-762 207, Price \$3.75 printed copy; \$1.45 microfiche. Technical Report 73-0159, March 1973. 38 p, 16 fig, 4 tab, 13 ref.

Descriptors: *Fog, *Ice fog, *Weather modifica-tion, Cloud seeding, Cloud physics, Meteorology. Identifiers: *Fog dispersal.

From the standpoint of modification and prevention of fog, it is most appropriate to classify fog according to its constitution and temperature. Ice fog occurs at temperatures below-30deg C and is composed of ice particles. Supercooled fog is composed of liquid water droplets at temperatures below 0 deg C. Warm fog has, in general, the same drop size and number concentration as super-cooled fog, but occurs at temperatures above freezing. Visibility is inversely related to fog particle number concentration, and inversely related to the square of fog particle size. Hence, visibility can be improved by decreasing the number of particles or decreasing the size of the particles by a much smaller amount. Evaporation methods are the most practical of all known fog dispersal techniques. Supercooled fog is the most amenable to dispersal by artificial means. The modification techniques involve the creation of ice particles that grow at the expense of the droplets and eventually fall out. Of the three fog types, warm fog is by far the most common in the midlatitudes where fog causes the greatest problems. The most promising technique, but also the most expensive from the standpoint of initial investment, is the use of ground-based heat to raise the air temperature and thus cause the droplets to evaporate. Ice fog has, so far, resisted all tested methods of dispersal. Prevention can best be achieved by very careful control of the manmade moisture moisture sources that lead to the formation of the fog. (Knapp-USGS) W74-08177

WOODY PHREATOPHYTES ALONG THE COLORADO RIVER FROM SOUTHEAST RUN-NELS COUNTY TO THE HEADWATERS IN BORDEN COUNTY, TEXAS, Geological Survey, Austin, Tex. D. C. Larner, R. M. Marshall, A. E. Pfluger, and S.

Texas Water Development Board Report 182, April 1974. 19 p, 23 fig, 5 tab, 14 ref.

Descriptors: *Phreatophytes, *Texas, Surveys, *Tamarisk, Mesquite, Evapotranspiration, Reservoirs, Alluvial channels, Water balance. Identifiers: *Colorado River(Tex).

The increase in saltcedar acreage in the upper Colorado River of Texas corresponds closely with the construction dates of reservoirs along this section of the river. Lake Colorado City was completed in 1949, Lake J. B. Thomas in 1952, and Champion Creek Reservoir in 1959. A decrease in the magnitude and frequency of floods, because of reservoir construction, is favorable to a more rapid spread of phreatophytes in the stream below the reservoir. With the construction of additional

reservoirs along the river, the channel area below the reservoirs becomes much more favorable for saltcedar spread. Saltcedar covered approximately 2,000 acres in the upper portion of Lake J. B. Thomas, and saltcedar and willow covered an additional 2,026 acres. Mesquite originally covered 35,025 acres, but 25,663 acres have had brush control work applied - aerial sprayed, root plowed, tree dozed, cabled, or chained - leaving 9,362 acres of untreated mesquite in the flood plain. There were 823 acres of light density, 1,156 acres of medium density, and 7,383 acres of heavy mesquite untreated. Most of the saltcedar acreage is in reservoir areas and along the river channel where a full supply of water is readily available for use. As much as 3 acre-feet of annual water salvage per acre could be expected in these areas. One acre-foot saving per acre could also be made on the bottomlands by replacing the saltcedar with adapted grasses. Based on these findings, it can safely be assumed that at least 10.200 acre-feet of sately be assumed that at least 10,200 acre-feet or water could be saved annually with control pro-grams. It can be expected that the coverage of salt-cedar will expand as the lake levels decline during summer and drought periods and the medium and low flows of the Colorado River continue. (Knapp-W74-08371

WATER RESOURCES DEVELOPMENT IN WEST MALAYSIA, Drainage and Irrigation Dept., Kuala Lumpur,

Cheong Chup Lim, and Goh Kiam Seng Cheong Chup Lim, and Gon Kiam Seng.

In: Water Resources, Environment and National
Development--Volume II: Selected Papers;
Proceedings of Regional Workshop by Science
Council of Singapore and National Academy of
Sciences of the USA, Singapore, March 13-17,
1972: Science Council of Singapore, p 100-102,

Descriptors: *Water resources development, *Planning, *Water balance, Data collections, Hydrologic data, Streamflow, Rainfall, Irrigation water, Water utilization, Water supply. Identifiers: *Malaysia.

The annual rainfall in West Malaysia averages 100 inches. However, because of the high potential evapotranspiration which has been estimated to evapotranspiration which has been estimated to reach nearly 70 inches per annum, the water resources available for use are only moderate. The Northeast Monsoon often brings heavy rains. Con-tinuous heavy rain can exceed 24 inches within 24 hours. The east and northwest coasts of West Malaysia are occasionally subject to droughts up to 3 months' duration. Rivers in West Malaysia are generally short and steep for the greater part of their courses, generally with an absence of natural lakes or storage areas. Due to rapid economic development in recent years, utilization is fast approaching the limit of surface water in many localities. The problems posed by the diminishing un-committed water resources and the rapid rate of water resources developed call for a rational utilization of water and a concerted effort towards water conservation. This in turn necessitates a total water resources planning approach. Basic to this requirement is a proper inventory of the available surface and groundwater resources, and been committed for various uses. (See also W74-08454) (Knapp-USGS) W74-08463

THE SEVIER COUNTY WATER PLAN, Tennessee Dept. of Conservation, Nashville. Div.

of Water Resources. For primary bibliographic entry see Field 6D. W74-08493

HYDROLOGIC EFFECTS OF PATCH CUTTING OF LODGEPOLE PINE, National Oceanic and Atmospheric Administra-tion, Fort Collins, Colo.

For primary bibliographic entry see Field 4C. W74-08603

AN APPRAISAL OF THE GROUNDWATER RESOURCES OF THE UPPER CAPE FEAR RIVER BASIN, NORTH CAROLINA,

Geological Survey, Raleigh, N.C. For primary bibliographic entry see Field 4B.

3C. Use Of Water Of Impaired Quality

DRAINAGE OBSERVATIONS IN LATIN AMER-

ICA, Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 4A.
W74-08268

SALINE-SEEP DEVELOPMENT IN DRYLAND SOILS OF NORTHEASTERN MONTANA,

Agricultural Research Service, Sidney, Mont. A. D. Halvorson, and A. L. Black. No 2, p 77-81, March-April 1974. 3 fig. 3 tab. 19

Descriptors: *Saline soils, *Leaching, *Scepage, Evapotranspiration, *Montana, Percolation, Infiltration, Groundwater movement, Topography, Soil water movement.
Identifiers: *Saline sceps.

The relationship of saline-seep development and growth to precipitation, soil water content, and water use by spring grains in a crop-fallow rotation was studied in northeastern Montana. When precipitation exceeds the amount needed to recharge the soil profile, water percolates below the crop root zone and accumulates above a layer of nearly impermeable, dense clay. Permeable layers of degraded sandstone, siltstone, and lignite conduct the perched groundwater laterally to a point where the water-conducting layers are truncated by glacial till of lower permeability. By capil-larity, water moves upward in the till to the soil surface where it evaporates, leaving precipitated salts (Na. Mg. and Ca sulfates) on the soil surface in the seep area. Factors that enhance deep percolation of water below the root zone include above-average annual precipitation, unusually high fall and spring precipitation when evapotranspiration potentials are low, increased use of summer fallow, and improved soil water storage efficency and conservation practices during fallow. Intensive cropping systems, using small grains, grasses, and deep-rooted crops, with are needed to prevent loss of soil water by deep percolation and to alleviate the development of saline seeps. (Knapp-USGS) minimum summer fallow in flexible crop rotations

SALINITY-OZONE INTERACTIONS ON PINTO BEAN: INTEGRATED RESPONSE TO OZONE CONCENTRATION AND DURATION,

Agricultural Research Service, Riverside, Calif. Salinity Lab.

Journal of Environmental Quality, Vol 2, No 3, p 400-404, July-September, 1973. 2 fig, 2 tab, 13 ref.

Descriptors: *Salinity, *Air pollution effects, *Air pollution, Plant growth, *Beans, Leaves, *Ozone, Oxidation, Osmotic pressure, Water pollution ef-

This investigation was conducted to determine the integrated effects of concentration and duration of ozone exposure on the injury, growth, and mineral composition of pinto bean during rapid vegetative growth and to evaluate the interactive effects of

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3C-Use Of Water Of Impaired Quality

salinity. Plants were grown in controlled environment chambers in non-saline and two saline nutrient solution cultures having osmotic potentials of -0.4, -2.4, and -4.4 bars, respectively Ozone-free plants were compared with plants treated daily for 2 weeks with ozone doses of from 0.15 to 0.90 ppm-hour. Plant injury and reduction in growth were sigmoidal functions of ozone dose. Plant tolerance thresholds were found for both concentration and duration of ozone exposure. Daily exposures above threshold levels produced cumulative injury that progressed from the primary leaves to subsequent trifoliate leaves. Although salinity suppressed plant growth, it extended the tolerance thresholds for duration of ozone exposure and significantly reduced the injury by ozone. Ozone decreased Ca, Mg, K and N contents of the leaves, increased stem contents of these elements. and had relatively little effect on root contents. (Skogerboe-Colorado State) W74-08330

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES, Toronto Univ. (Ontario). Inst. of Environmental

Sciences and Engineering. For primary bibliographic entry see Field 5E. W74-08397

3D. Conservation In Domestic and Municipal Use

PROBLEMS ARISING FROM OVER EXPLOITATION OF THE NATURAL WATER RESERVOIR IN THE URBAN DISTRICT OF MILAN (I PROBLEMI POSTI DAL SOVRAS-FRUTTAMENTO IDRICO DEL SERBATOIO NATURALE NELLA CONURBAZIONE MILANESE).

For primary bibliographic entry see Field 4B. W74-08354

APPRAISAL OF THE WATER RESOURCES OF EASTERN PALM BEACH COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 4B. W74-08445

DIFFICULTIES IN PLANNING WATER SUPPLY SCHEMES IN WEST MALAYSIA. Malaysia Dept. of Water Supply, Kuala Lumpur. For primary bibliographic entry see Field 6B. W74-08462

SUMMARY REPORT ON POLLUTION CON-TROL IN INDONESIA,

Ministry of Public Works and Electrical Energy, Djakarta (Indonesia). Planning and Urban Development.

For primary bibliographic entry see Field 5G. W74-08484

EROSION CONTROL AND BANK STABILIZA-TION IN METROPOLITAN TORONTO--10 YEAR PROGRAMME AND 5 YEAR PROJECT. Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario).

For primary bibliographic entry see Field 4D. W74-08488

THE METROPOLITAN TORONTO AND RE-GION WATERFRONT PLAN, 1972-1976.

Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario). For primary bibliographic entry see Field 6B. W74-08489

DEVELOPMENT: POLITICS OF MASTER PLANNING,

Illinois Univ., Urbana. Inst. of Government and Public Affairs.

D. R. Judd, and R. E. Mendelson.
In: Politics of Urban Planning: The East Saint Louis Experience, University of Illinois Press, Urbana, 1973, p 73-117.

Descriptors: *Planning, *Area redevelopment, *Political aspects, *Political constraints, Comprehensive planning, Project planning, Decision making, Government, Legal aspects, Eminent domain, *Illinois.

Identifiers: *Riverfront development, *East St. Louis(III), Terminal Railroad Association, Rail-

The 400 acres that comprise the East St. Louis, Illinois riverfront is primarily railroad trackage and wasteland. Although numerous redevelopment plans have been made, none have been implemented. The railroads and a lack of funding have been the major obstacles. Until very recently, the railroads vehemently opposed renewal proposals and refused to give up any of their riverfront land which is owned by the Terminal Railroad Association, and its subsidiary, the Wiggins Ferry Company. Severe financial reverses and the unsuita-bility of the riverfront for rail needs have tempered their position. However, funds have not been available to purchase land from the railroads or to subsidize their relocation. The municipality of East St. Louis has not been fiscally able to assist in land acquisition site improvement, or land write-down. Requests by East St. Louis for state and federal funding have been rejected. One example of the impact of inadequate resources was the failure to build any of the proposed internal roads, sightseeing roads, or connections with the Great River Road that would make the area accessible, a necessary prerequisite to any development. Other development proposals, ranging in scope from the location of the National Museum of Transport on the riverfront to the city-within-acity concept of PACE (Progress and Action by Citizens' Efforts) ended in failure. In 1971 a new riverfront planning study by the East-West Gateway Coordinating Council was announced. Its success will depend on political constancy - on whether or not it will be backed by the legal powers and resources of all levels of government. (Hoffman-North Carolina) W74-08495

WATER AND SEWER SUPPLY DECISIONS: A CASE STUDY OF THE WASHINGTON SUBUR-BAN SANITARY COMMISSION,

Virginia Univ., Charlottesville.
For primary bibliographic entry see Field 5G.
W74-08497

SYSTEMS PLANNING DESIGN: CASE STUDIES IN MODELING, OPTIMIZATION, AND

EVALUATION, Massachusetts Inst. of Tech., Cambridge. Center for Transportation Studies. For primary bibliographic entry see Field 6A. W74-08506

SYSTEMS ANALYSIS OF LARGE-SCALE PUBLIC FACILITIES: NEW YORK CITY'S WATER SUPPLY NETWORK AS A CASE STUDY.

Massachusetts Inst. of Tech., Cambridge. Center for Transportation Studies R. de Neufville.

In: Systems Planning and Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D. H. Marks), Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 30-47 (Chapter 4), 1974. 5 fig. 13 ref.

Descriptors: *Systems analysis, *Design, *Water supply development, *Computer models,

*Simulation analysis, Evaluation, *Alternative planning, *Economics, Tunnel design, Reliability, Water distribution(Applied), Optimization, Economies of scale, Institutional constraints, Mathematical models, Networks, New York, Facilities.

Identifiers: Capacity expansion, *New York City, *Cost-effectiveness.

The strengths and weaknesses of systems analysis are explored by means of a case study: the designing of a large-scale civil engineering facility, the billion-dollar additions to New York City's water supply system. Amid disagreement between budgetary authorities and a municipal design agency, the Board of Water Supply, systems analysis were called upon to determine relevant criteria for evaluation, develop system models to explore alternatives, and recommend an economically timal design and implementation strategy. A fivestep iterative process was derived. Alternatives were evaluated utilizing mathematical models of the water supply system which could be used in a computer to explore hundreds of possible configurations. The evaluation was conducted in terms of a cost-effectiveness analysis. Included were a distributional and a reliability objective. The systms analysis indicated that economies of up to 50% were possible over the anticipated cost of the original proposal generated by the traditional en-gineering design process. Although the planners could choose specifically what kind of design they thought most effective, significant institutional constraints precluded the use of some forms of economically desirable systems. The systems analyst can at best hope to achieve a compromise. (See also W74-08506) (Bell-Cornell)

ANALYSIS OF WATER REUSE ALTERNA-TIVES IN AN INTEGRATED URBAN AND AGRICULTURAL AREA,

Utah Water Research Lab., Logan. For primary bibliographic entry see Field 5D.

MUNICIPAL MUNICIPAL WATER PREFEREI STATUTES: THE TEXAS WAGSTAFF ACT, PREFERENCE Utah Univ., Salt Lake City. Coll. of Law For primary bibliographic entry see Field 6E. W74-08546

WATER FROM THE COASTAL PLAIN AQUIFERS IN THE WASHINGTON, D.C., METROPOLITAN AREA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 4B.

3E. Conservation In Industry

INDUSTRIAL ASPECTS OF WETLAND USES, Northeast Utilities Service Co., Hartford, Conn. Environmental Planning Coordination. For primary bibliographic entry see Field 6E W74-08171

PROBLEMS ARISING FROM OVER EX-PLOITATION OF THE NATURAL WATER RESERVOIR IN THE URBAN DISTRICT OF MILAN (I PROBLEMI POSTI DAL SOVRAS-FRUTTAMENTO IDRICO DEL SERBATOIO NATURALE NELLA CONURBAZIONE

For primary bibliographic entry see Field 4B. W74-08354

SOME USEFUL IDEAS ON WASTE WATER REDUCTION.

Western Electric Co., Inc., New York, N. For primary bibliographic entry see Field 5D. W74-08355

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Conservation In Agriculture—Group 3F

PULP, PAPER, AND BOARD IN THE EN-VIRONMENT - PART 8: ENVIRONMENTAL PROBLEMS OF THE WEST GERMAN PULP, PAPER, AND BOARD INDUSTRY.

For primary bibliographic entry see Field 5G. W74-08405

A 6000 GALLON/TON FINE PAPER MACHINE

WATER SYSTEM, American-Israeli Paper Mills Ltd., Hadera (Israel). For primary bibliographic entry see Field 5D. W74-08424

POLLUTION ABATEMENT IN EFFLUENTS FROM CONSTRUCTIONAL FIBERBOARD MANUFACTURE (Z BADAN NAD REDUKCJA OBCIZENIA SCIEKOW W PRZEMYSLE PLYT PILSNIOWYCH),

A. Nowak. Prace Instytutu Technologii Drewna, Vol 19, No 1/2, p 211-223, 1972. 3 fig, 11 tab, 12 ref. (English

*Pulp *Waste wastes. waste water(Pollution), *Pollution abatement, *Water conservation, *Water pollution sources, Hydrolysis, Chemical degradation, Neutralization, Acids, sis, Chemical degradation, Neutralization, Acids, Alkalis(Bases), Sodium hydroxide, Wood wastes, Effluents, Biochemical oxygen demand, Chemical oxygen demand, Pulp and paper industry, Europe. Identifiers: Asplund pulp, Fiberboard(Building board), Pulp yield, Wood chips, *Poland.

The wet-process manufacture of fiber building boards by the Asplund method involves steam reatment of wood chips (usually at 170-185 C for 1-15 min), followed by defibration (fiber separation) in a mechanical refiner, and normally yields highly polluted effluents with 5-day BOD of ca. 50 ke oxygen per ton of board. Rather than engaging in costly and unsatisfactory effluent purification trials, efforts in Poland concentrated on reduc-tions of freshwater consumption (from 70-100 to ca. 30 cu m per ton) and on process modifications aimed at minimizing hydrolytic degradation products. This was achieved both in laboratory and industrial experiments by pretreating the chips with NaOH for 0.5-18.0 hr, thereby converting acidic wood components into their water-soluble sodium salts. The addition of 0.5-0.7% NaOH (calculated as sodium oxide, based on oven-dry wood weight) was found to reduce the effluent's COD by 16.3% and its 5-day BOD by 27.2%, at the same time improving the yield of defibrator pulp by ca. 6% without affecting its quality. Higher alkali doses impaired the quality of pulp boards and did not further reduce the effluent's pollution load. (Stapinski-IPC) W74-08426

POLLUTION OF THE DRAMMENS RIVER BY INDUSTRY THE WOOD-PROCESSING (TREFOREDLINGSINDUSTRIENS UTSLIPP TIL DRAMMENSVASSDRAGET),

For primary bibliographic entry see Field 5B. W74-08428

SOME RESULTS OF WATER PURIFICATION AT VISCOSE RAYON FACTORIES (NEKOTORYE ITOGI RABOTY VODOOCHIST-NYKH SOORUZHENNII PREDPRIYATII **FACTORIES** PREDPRIYATII VISKOZNYKH VOLOKON),

Vsesoyuznyi Nauchno-Issledovatelskii Institut Iskusstvennogo Volokna, Leningrad (USSR). Leningradskii Filial.

For primary bibliographic entry see Field 5D. W74-08429

PULP INDUSTRY AND ENVIRONMENTAL PROTECTION (ZELLSTOFF-INDUSTRIE UND

UMWELTSCHUTZ), For primary bibliographic entry see Field 5D. W74-08436

LAMELLAR SEDIMENTATION OF FIBER-CARRYING WASTE WATERS CAMELLSEDIMENTERING AV FIRERHOL. DIG VANN).

Norwegian Pulp and Paper Research Inst., Oslo. For primary bibliographic entry see Field 5D. W74-08437

WATER RESOURCES, ENVIRONMENT AND NATIONAL DEVELOPMENT--VOLUME I: SUMMARY OF PROCEEDINGS, AND VOLUME II: SELECTED PAPERS.

For primary bibliographic entry see Field 5G. W74-08454

DISPOSAL OF INDUSTRIAL TRADE EF-FLUENTS FROM THE FOOD INDUSTRIES, Singapore Inst. of Standards and Industrial Research.

For primary bibliographic entry see Field 5D. W74-08468

W74-08469

POLLUTION CONTROL OF DISCHARGES INTO RIVERS, STREAMS AND SEA, BP Refinery Singapore Pty. Ltd. For primary bibliographic entry see Field 5G.

PETROLEUM REFINERY EFFLUENT QUALI-TY CONTROL,

Esso Research and Engineering Co., Linden, N.J. For primary bibliographic entry see Field 5D. W74-08473

3F. Conservation In Agriculture

ANIMAL WASTE UTILIZATION FOR POLLU-TION ABATEMENT TECHNOLOGY AND ECONOMICS. PHASE II,

Nebraska Univ., Lincoln. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 5D. W74-08231

OBJECTIVES OF IRRIGATION MANAGE-

MENT COMMITTEE,
Agricultural Research Service, Fort Collins, Colo. D. F. Heermann.

Paper No 72-769 presented at Winter Meeting of the American Society of Agricultural Engineers, December 11-15, 1972, Chicago, Illinois, 10 p. 53

Descriptors: Irrigation, Irrigation practices, *Irrigation programs, *Management, Water *Irrigation programs, management(Applied).

The Irrigation Group of the American Society of Agricultural Engineers has reorganized and established a committee for Irrigation Management. The scope and objectives of the committee are presented. The interaction of the Irrigation Management Committee and other committees in the Society are discussed. The challenge for the new committee is to improve the management and operation of irrigation systems. (Skogerboe-Colorado State) W74-08264

GROW WHEAT AND GRAIN SORGHUM WITH LESS WATER

Irrigation Age, Vol 6, No 11, p 7-10, June, 1972.

Descriptors: *Irrigation practices, *Irrigation programs, Soil moisture, Crop response, Irrigation systems, *Wheat, *Grain sorghum, *Texas.

Methods for obtaining maximum yield from limited irrigation water are discussed for wheat and milo. A brief summary is presented of work

performed at the Southwestern Great Plains Research Center in Bushland, Texas. Surprisingly good yields from very limited water supplies have been demonstrated. (Skogerboe-Colorado State)

IRRIGATION NUMBER--A NEW TECHNIQUE TO EVALUATE IRRIGATION ADVANCE DISTANCE.

Indian Inst. of Tech., Kharagpur. Dept. of Agricul-

G. Sastry, and S. C. Agarwal.

Journal of Agricultural Engineering Research, Vol 18, No 3, p 189-195, September, 1973. 1 fig. 1 tab. 12 ref

Descriptors: *Irrigation design, *Irrigation engineering, *Irrigation practices, Surface irrigation, Irrigation efficiency, Irrigation systems, efficiency. Irrigation *Forecasting.

Prediction of irrigation advance distance for a given set of initial conditions such as slope of land surface, inflow stream per unit top width of flow. infiltration characteristics and hydraulic conductivity of soil bed, is important in order to design efficient surface irrigation systems. A dimensional analysis of variables involved in water advance phenomenon has been made to derive a satisfactory equation. Available data have been analyzed and fitted by least square method of curve fitting to yield an equation of the type M = A(N) B. The slope of each curve B is observed to be fairly constant and coefficient A has been related with irrigation number. An irrigation advance function relating these dimensional parameters is proposed. (Skogerboe-Colorado State) W74-08266

REFLECTANCE DISCRIMINATION OF COT-TON AND CORN AT FOUR GROWTH STAGES, Agricultural Research Service, Weslaco, Tex.

H. W. Gausman, W. A. Allen, R. Cardenas, and A. J. Richardson.

Agronomy Journal, Vol 65, No 2, p 194-198. March-April, 1973. 6 fig. 1 tab, 12 ref.

Descriptors: *Remote sensing, *Reflectance, Infrared radiation, Instrumentation. *Corn(Field), *Cotton. Surveys,

Increasing leaf age of corn within four growth stages had little effect on near-infrared light reflectance whereas mature leaves of cotton had higher near-infrared light reflectance than young leaves. Reflectance was linearly correlated with chlorophyll concentration for the four growth stages of corn at the 550-nm wavelength: the linear correlation of reflectance with chlorophyll for the four growth stages of cotton was significant at the 650-nm wavelength. The largest differences among reflectances of corn leaves of different ages within growth stages occurred when tassels were appearing in the leaf whorls; this may be the best time to discriminate corn from other vegetation with remote sensors. Reflectance differences among cotton leaves within the four growth stages were cotion leaves within the four growth stages were similar. Spectral wavelength intervals centered aroung the 680-, 850-, 1,650-, and 2,200-nm wavelengths provide for the optimum discrimina-tion of vegetation. (Skogerboe-Colorado State) W74-08269

INFILTRATION AND ROOT EXTRACTION SUBSURFACE IRRIGATION LATERALS.

Minnesota Univ., St. Paul. Dept. of Agricultural Engineering. Saint Paul.

J. R. Gilley, and E. R. Allred. Paper No 72-743 presented at Winter Meeting of the American Society of Agricultural Engineers, December 11-15, 1972, Chicago, Illinois, 27 p, 11 fig. 4 tab. 29 ref

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

Descriptors: *Irrigation, *Subsurface irrigation, Irrigation practices, Soil moisture, Soil water movement, Soil physics, *Infiltration, Model stu-

An analytical solution to the soil moisture flow equation was used to simulate flow in partially saturated soils during steady infiltration from buried line sources. A series of plane sinks was used to model water consumption by plants. The resulting model was used to determine optimum lateral placement to obtain desired crop extraction pat-terns. (Skogergoe-Colorado State) W74-08270

CROP COOLING WITH SPRINKLERS.

Department of Agriculture, Lethbridge (Alberta). Research Station. F. H. Hobbs.

Canadian Agricultural Engineering. Vol 15, No 1, p 6-8, June, 1973. 3 fig, 1 tab, 15 ref.

Descriptors: *Temperature control, *Sprinkling, Coolants, Water, Temperature, Irrigation practices, Surface irrigation, Sprinkler irrigation, Climates, Potatoes, *Beans, Evaporation control.

Irrigated plots of potatoes and bush beans were sprinkled intermittently with water whenever the ambient air temperature exceeded 80 degrees Fahrenheit. Conventional but low-volume irrigation equipment was used to apply the cooling water at a net theoretical application rate of 0.026 inches per hour. Over a 3-year period and 88 applications this sprinkling rate effectively reduced plant canopy air temperature. The average temperature reduction was 6 Fahrenheit degrees but reductions as large as 16 Fahrenheit degrees occurred. The amount of cooling achieved was dependent upon the weather prevailing during cooling. Humidity exerted the greatest single influence, maximum air temperature was next in importance, and wind was less well related. The multiple regression equations indicate the amount of temperature reduction likely to be achieved with field-type sprinkler irrigation (Skogerboe-Colorado State) equipment. W74-08271

SOIL MOISTURE PROFILE UNDER STEADY INFILTRATION

Auburn Univ. Ala. Dept. of Agricultural Engineer-

For primary bibliographic entry see Field 2G.

W74-08273

DETERMINATION OF WATER INTAKE RATE OF ADVANCE, Pant Coll. of Technology Pantnagar (India).

P. Singh, and H. S. Chauhan.

Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 6, p 1081-1084, November-December, 1973. 4 fig, 14 ref.

Descriptors: *Infiltration rates, *Soils, Infiltra-tion, *Infiltrometers, Moisture meters, Infiltra-tion, *Surface irrigation.

The relationship obtained is an attempt to improve existing methods for estimating intake rate in surface irrigation based on rate of water advance data. The comparison of the relationship with experimental data suggests that the cylinder in infiltrometers under-estimate intake rate at small values of time and over-estimate the intake rate at large values of time. The inflow-outflow method also may not represent actual intake rate because of errors due to surface storage. The method based on rate of water advance provides a good estimate of intake rate in surface irrigation. (Skogerboe-Colorado State) W74-08275

CONCEPTS OF CONSERVATION TILLAGE SYSTEMS USING SURFACE MULCHES, Nebraska Univ., Lincoln. Dept. of Agricultural

Engineering. H. D. Wittmuss, G. B. Triplett, Jr., and B. W.

Greb. Technical Paper No. 1. Presented at National Conservation Tillage Conference, March 28-30, 1973, Des Moines, Iowa. 14 p, 1 tab, 43 ref.

Descriptors: *Soil conservation, *Erosion, Soil erosion, Water conservation, *Cultivation, Erosion control. Erosion rates.

A brief summary of the need and effects of conservation tillage is presented. Effects on soil erosion of some tillage practices are listed. (Skogerboe-Colorado State) W74-08277

PROBLEMS AND SCS SPECIFICATIONS FOR LOW HEAD PVC PIPELINES, Soil Conservation Service, Bozeman, Mont.

For primary bibliographic entry see Field 8B. W74-08278

CONTROLLING SOIL CRUSTING WITH PHOSPHORIC ACID TO ENHANCE SEEDLING EMERGENCE.

Agricultural Research Service, Kimberly Idaho. Snake River Conservation Research Center. C. W. Robbins, D. L. Carter, and G. E. Leggett. Agronomy Journal, Vol 64, No 2, p 180-183, March-April, 1972. 3 tab, 15 ref.

Descriptors: *Soil physics, *Soil aggregates, Soil management, *Sugar beets, Fertility, Phosphorus, Soil structure, Soil treatment, *Crop production. Identifiers: Soil crusting, *Phosphoric acid.

study was conducted to determine if spraying dilute phosphoric acid in narrow bands along the seeded rows would increase sugar beet seedling emergence by preventing or minimizing soil crust-ing and provide the needed nutritional P for crop production. Dilute phosphoric acid was sprayed along rows seeded to sugar beets on a Portneuf silt loam. Several acid concentrations and P rates were applied. Stand counts were made before and after thinning, and P concentrations were measured in sugar beet petioles sampled at three dates during the growing season. Laboratory studies were conducted to determine the effects of the phosphoric acid on soil properties. Applying 69 kg P/ha as dilute phosphoric acid in liquid volumes of 650 to 1,300 liters/ha reduced crusting by increasing aggregate stability in the soil surface, increased sugar beet seedling emergence, and provided the P needed by the sugar beet crop. (Skogerboe-Colorado State) W74-08279

A COMPUTER MODEL FOR PREDICTING NITRATE AND OTHER SOLUTES OF AGRICULTURAL DRAIN WATER,

Arizona Univ., Tucson. Dept. of Soils, Water and Engineering. For primary bibliographic entry see Field 5B. W74-08280

CONSIDERING IRRIGATED GRASS. TAKE A TIP FROM NEW MEXICO.

Irrigation Age, Vol 6, No 10, p 18-19, 32, 34, 35, May, 1972. 2 fig.

Descriptors: *Grasses, *Range grasses, Wheat-grasses, Switchgrass, Plant groupings, Hay, Pastures, Ranges, *Irrigation, *New Mexico.

Row cropping irrigated grass in Curry County, New Mexico is described. The crop pays dividends when the net return is compared to irrigated wheat and milo. Farmers in the area are literally farming the grass. Several farmers in and around Clovis have records to show \$70, \$80 and more net profit per acre from irrigated grass. An extensive economic study revealed a net of \$7.81 per acre for irrigated wheat and \$16.21 per acre for irrigated milo. Most popular grasses to date in the area are Jose Tall Wheatgrass for the cool season pasture and Blackwell Switch Grass for the warm season species. (Skogerboe-Colorado State) W74-08282

CENTER PIVOT PROBLEMS. Irrigation Age, Vol 6, No 9, p 38-40, April, 1972. 1

Descriptors: *Irrigation practices, Surface irriga-tion, *Sprinkler irrigation, Irrigation systems, Ir-rigation design, Application equipment. Identifiers: *Center pivot sprinklers

The problem associated with center pivot sprinkler systems are outlined. Reasons for not using marginal land are given. A chart for determining chances of success is presented. (Skogerboe-Colorado State) W74-08283

GATED PIPE AND REUSE SYSTEM. Irrigation Age, Vol 6, No 9, p 18-20, 45, April, 1972. 2 fig.

Descriptors: *Irrigation practices, Surface irriga-tion, Furrow irrigation, *Irrigation systems, Irriga-tion design, *Water reuse, *Pipes, *Nebraska.

using gated pipe and a tailwater reuse system is presented. (Skogerboe-Colorado State) W74-08284

MONITORING FLOOD DAMAGE WITH SATELLITE IMAGERY.

South Dakota State Univ., Brookings. Remote Sensing Inst.

For primary bibliographic entry see Field 4A. W74-08294

MAXIMUM CORN YIELDS WITH MINIMUM

Irrigation Age, Vol 7, No 10, p 18-20, 22-23, May, 1973. I fig, 4 tab.

Descriptors: *Irrigation practices, *Surface irriga-tion, Soil moisture, Soil water, Crop response, *Corn(Field), Root zone, *Crop production.

The development of automated irrigation has introduced the possibility of a new concept to irriga-tion water management. That is, not completely refilling the root zone each irrigation; thereby leaving soil moisture storage capacity within the root zone to take advantage of any rainfall that occurs during the irrigation season. The old recom-mendation of refilling the root zone each irrigation mendation of refuling the root zone each irrigation is wasteful in both fertilizer and water. It is wasteful in that if rainfall occurred soon after the field was irrigated, water would percolate below the root zone carrying soluble nutrients such as nitrates with it. (Skogerboe-Colorado State) W74-08312

RECOVERY OF N15-LABELED FERTILIZERS IN FIELD EXPERIMENTS, Illinois Univ., Urbana. Dept. of Agronomy

For primary bibliographic entry see Field 5B. W74-08315

OPERATION AND MAINTENANCE OF IR-RIGATION AND DRAINAGE SYSTEMS: SEC-TION III--OPERATION.

American Society of Civil Engineering, New York. Committee on Operation and Maintenance of Irrigation and Drainage Systems. For primary bibliographic entry see Field 4A.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Conservation In Agriculture—Group 3F

W74-08318

UNIFORM IRRIGATION WITH LOW-PRES-SURE TRICKLE SYSTEMS,

Agricultural Research Service, Phoenix, Ariz.
Water Conservation Lab.

L. E. Myers, and D. A. Bucks.

Journal of the Irrigation and Drainage Division.

American Society of Civil Engineers, Vol 98, No IR3, p 341-346, September, 1972. 2 fig, 7 ref.

Descriptors: *Irrigation systems, *Applications systems, *Orifices, *Irrigation practices, Pipe flow, Water distribution(Applied), Distribution systems, Irrigation design, Irrigation engineering, Irrigation, Irrigation efficiency. Identifiers: *Trickle irrigation

Application uniformity from low-pressure trickle irrigation systems can be greatly improved by varying emitter sizes to compensate for friction-induced pressure changes in the lateral pipe. Low-pressure systems using simple emitter sizes suffer from nonuniform emitter because friction-induced from nonuniform emitter because friction-induced pressure changes are a large percentage of total pressure. High-pressure trickle systems alleviate this problem by using high head emitters. Low-pressure systems, using simple emitters, can have several advantages over high-pressure systems in reduced manufacturing and operating costs, larger orifices to reduce clogging, and simpler flow control devices. Comparable application uniformity can be obtained by varying emitter sizes in the low-pressure multiple-emitter size trickle systems. Procedures for designing low-pressure multiple-emitter size trickle systems. tow-pressure mutiple-emitter size trickle systems by computer or by a simplified computation and graphic method were developed. (Skogerboe-Colorado State) W74-08323

AGRICULTURAL CHEMICALS IN RELATION TO ENVIRONMENTAL QUALITY: CHEMICAL FERTILIZERS, PRESENT AND FUTURE, Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural and Chemical Development. For primary bibliographic entry see Field 5B. W74-08325

CHEMICAL AND BIOCHEMICAL CONSIDA-TIONS FOR MAXIMIZING THE EFFICIENCY OF FERTILIZER NITROGEN, Agricultural Research Service, Baton Rouge, La. For primary bibliographic entry see Field 5B. W74-08326

COMPUTER SIMULATION OF CRO PRODUCTION - POTENTIAL AND HAZARDS, North Carolina State Univ., Raleigh. Dept. of Agricultural Engineering.
H. D. Bowen, R. F. Colwick, and D. G.

Batchelder. Agriculutral Engineering, Vol 54, No 10, p 42-45, October, 1973. 2 fig, 20 ref.

Descriptors: *Computer models, *Plant growth, *Cotton, Yield equations, *Crop production, Plant populations, *Simulation analysis, *Southwest U.S.

Work completed by various investigators in the field of computer simulation is reviewed. The purpose and progress of Project S-69 is described. A committee from cotton producing states in the Southwest is studying the computer simulation of the growth of cotton plants. Hazards are discussed. (Skogerboe-Colorado State) W74-08331

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE RIO GRANDE BASIN, TEXAS,

Geological Survey, Austin, Tex. For primary bibliographic entry see Field 5B.

HYDRODYNAMICS OF SURFACE IRRIGA-TION-ADVANCE PHASE.

California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-08384

SEDIMENT POLITING IN IRRIGATION CANAL

Colorado State Univ., Fort Collins. Dept. of Civil Engineering For primary bibliographic entry see Field 2J. W74-08385

IMPROVED WATER MANAGEMENT FOR PADDY RICE PRODUCTION IN THE PHILIP-

National Irrigation Administration, (Philippines). Water Management Project. S. I. Julian.

In: Water Resources, Environment and National

Development--Volume II: Proceedings of Re-gional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 103-120, 1972. 6 fig, 3 tab.

Descriptors: *Water management(Applied), Rice, *Irrigation practices, Land management, Irrigation water.
Identifiers: *Philippines.

Improved water management for paddy rice production includes the intergrated processes of diversion, conveyance, regulation, measurement, distribution, and application of the right amount of water at the proper time and removal of excess water from farms to promote increased production in conjunction with improved cultural practices. The Improved Water Management Project for paddy production in the Philippines has 4 distinct objectives: to work out and demonstrate the most suitable water management practices to increase the crop area served; to work out and demonstrate a more suitable cropping pattern to increase productivity; to organize irrigators association for the successful implementation of a well coordinated water distribution; and to adopt the pilot narea state unstroution; and to adopt the pilot area as a training center for on-the-job training of National Irrigation Administration personnel and farmers. (See also W74-08454) (Knapp-USGS) W74-08469)

RESEARCH ON THE CULTURE OF CERTAIN COMMON MARINE ORGANISMS IN SIN-GAPORE WATERS, Singapore Univ. Fisheries Biology Unit.

Ah Kow Tham, Thia Eng Chua, Swee Ling Yang, Chang Man To, and Seng Keh Teng.

In: Water Resources, Environment and National In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 251-255,

Descriptors: *Fish farming, *Oysters, *Mussels, Algae, Aquiculture, Fish management, Shellfish farming, Artificial substrates, Commercial shellfish, *Copepods, *Rhodophyta, *Shrimp. Identifiers: *Singapore.

In Singapore, some research effort is devoted to the study of the biology of the more common marine organisms. Some of the problems studied are the diminishing supply of oysters, mussels, certain seaweeds, marine prawns, exotic marine aquarium fish and certain species of marine food fish used for the restaurant trade. The experimental cultivation of Eucheuma spinosum, a local red alga, which is being harvested by fishermen in increasing quantities and exported to the USA. Europe and other developed countries is described. The experimental cultivation of the local green mussel, Mytilus viridis, a local oyster, Crassostrea cucullata and certain marine prawns as well as a marine copepod, Paracalanus crassirostris are also described. (See also W74-08454) (Knapp-USGS) W74-08477

HYDROLYSIS AND AVAILABILITY OF PYROPHOSPHATE IN TROPICAL SOILS, International Inst. of Tropical Agriculture, Ibadan

For primary bibliographic entry see Field 2G. W74-08498

THE EFFECT OF SOIL MOISTURE ON THE FREE AMINO ACID LEVEL IN WINTER WHEAT, (IN RUSSIAN),

G. A. Rzaev Izv Akad Nauk Az SSR Ser Biol Nauk. 2 p 26-31. 1972. Illus.

Identifiers: Identifiers: *Amino acid, *Soil moisture, *Wheat(Winter), Metabolism, Nitrogen compounds, Protein.

Studies of the effect of the soil humidity content on the free amino acid level in winter wheat shows that increased humidity contents cause more radi-cal changes in the synthesis and in the metabolism of nitrogen compounds than reduced humidity levels. Considerable decrease in the protein N content in both vegetative organs and grains due to reduced moisture content was observed .-- Copyright 1973, Biological Abstracts, Inc. W74-08541

NATURAL FORAGE RESERVE OF TURKMEN SSR AND WAYS OF ITS IMPROVEMENT TO DEVELOP SHEEP-RAISING, (IN RUSSIAN). Desert Inst., Ashkhabad (USSR).

V. N. Nikolaev.

Probl Osvoeniva Pustyn, 6 p 16-22, 1972, (English summary).

Identifiers: *Forage reserves, Protein, *Sheet raising, *USSR(Turkman-SSR), *Droughts.

Of a total of 49.8 million ha, 38.7 are desert ranges and 2.3 are mountainous. Annual grazing capacity is 5.7-6.6 million sheep. The deficiency of water is the main reason of ranges' insufficient utilization. Yield capacity and nutritional value of forage decrease considerably from spring to winter: forage reserves by 2-2.5, forage units by 5, content of digestible protein by 16. The latter causes protein deficiency in the animals. To increase forage reserve it is necessary to organize 15-25 specialized farms on the irrigated lands.--Copy-right 1973, Biological Abstracts, Inc. W74-08547

THE PROBLEMS OF INCREASED LIFE-ACTIVITY OF HYDROPONIC PLANTS, (IN RUS-SIAN), V. V. Kazaryan.

Biol Zh Arm. Vol 25, No 1, p 48-53, 1972. Illus. Identifiers: Corn(Field), Cucumber, *Hydroponic plants, Sunflower, *Crop response, Organic matter, Nitrogen, Phosphorus, Photosynthesis.

A comparison of sunflower, corn and cucumber plants grown in soil and grown under hydroponic conditions is presented. The development of roots and leaf mass was higher in the hydroponic plants. The roots of plants grown in soil were more branched that the hydroponic ones. However, comparison of N and P content in roots of plants grown under both conditions showed that hydroponic plants contained almost twice as much of these elements. Leaves had a higher photosynthetic activity in the hydroponic plants. The amino acid protein-N and P-containing or-ganic matter content was higher in the hydroponic plants, indicating a higher metabolic activity.--Copyright 1973, Biological Abstracts, Inc.

Field 4-WATER QUALITY MANAGEMENT AND CONTROL Group 4A - Control Of Water On The Surface

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE USE OF QUESTIONNAIRES IN COLLECT-ING INFORMATION FOR URBAN FLOOD CONTROL PLANNING,

Georgia Inst. of Tech., Atlanta. Environmental Resources Center.

For primary bibliographic entry see Field 6F.

W74-08151

PROBABILISTIC MODELS IN THE DESIGN AND OPERATION OF A MULTI-PURPOSE RESERVOIR SYSTEM,

Univ., of California, Los Angeles. Dept. of En-

gineering Systems. S. Arunkumar, and W. W-G. Yeh.

Available from the National Technical Informa-tion Service as PB-232 410; \$3.25 in paper copy, \$1.45 in microfiche. California Water Resources Center, University of California, Davis Contribu-tion No 144, December 1973. Technical Completion Report, 27 p, 2 fig, 10 tab, 20 ref. OWRR A-043-CAL(1).

Descriptors: *Regulation, *Mathematical models, Water utilization, *California, Model studies, *Optimal development plans, Probability, *Multiple-purpose reservoirs, *Reservoir operation, *Reservoir design.

The problem of determining optimal regulation policies for single and multi-reservoir systems is considered. The optimal policies are analytically characterized in terms of certain critical numbers for which upper and lower bounds are obtained. Necessary and sufficient conditions are derived in the case of a single reservoir, for the optimal policies for the finite horizon problem to be also optimal for the infinite planning horizon. These analytical characterizations lead to substantial savings in computation time needed to solve large problems. Numerical results are presented using the theoretical results developed in this report as well as for a reservoir system in California. (Snyder-California) W74-08153

LOW-FLOW CHARACTERISTICS OF KENTU-CY STREAMS,

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 7C. W74-08173

A PLAN FOR THE IMPROVEMENT OF THE LOW FLOW DATA NETWORK IN ALABAMA, Geological Survey, University, Ala.

For primary bibliographic entry see Field 7A. W74-08175

ROAD LOG AND GUIDE--GEOLOGY AND HYDROLOGY FOR PLANNING, ANCHORAGE

Geological Survey, Anchorage, Alaska. Alaska Geological Society Symposium Report, September 1973, 34 p. 22 fig, 16 ref.

Descriptors: *Hydrogeology *Landslides, *Earthquakes, Artificial recharge, Water pollution control, Erosion, Conferences. Identifiers: *Anchorage(Alaska).

Following the destructive 1964 earthquake, the need for a better understanding of the physical setting of the Anchorage area of Alaska became apparent. Increased geological and hydrological studies were initiated to provide base-line data so that development of the area might minimize environmental damage. This field trip guidebook highlights some of the problem areas and provides general background information of the geologic and hydrologic setting of the Anchorage area. (Knapp-USGS)

SURFACE-WATER AVAILABILITY, COLBERT

COUNTY, ALABAMA.
Geological Survey, Tuscaloosa, Ala.
A. L. Knight, D. M. O'Rear, and J. R. Harkins. Alabama Geological Survey Map 109, 1972. 5 fig, 1 tab, I map, 15 ref.

Descriptors: *Surface waters, *Maps, *Alabama, Streamflow, Reservoirs, Rivers, Water quality, Water balance, Water yield, Data collections, Hydrologic data. Identifiers: *Colbert County(Ala).

Surface-water information for Colbert County, Alabama, is presented in a map so that a visual appraisal of surface-water availability and comparison with other counties can be made. The average runoff from Colbert County is about I mgd per square mile. The Tennessee River, the largest potential source of surface water in the county, has an average flow of 32,800 mgd. Bear and Town Creeks have average flows of 870 and 260 mgd, respectively, at their mouths. The Tennessee River has a median annual 7-day low flow greater than 1,000 mgd. Other streams in the county have madian annual 7-day low flows less than 2 mgd except the lower reach of Spring Creek which is greater than 10 mgd. Average monthly flows of streams in the county are 4 to 12 times greater than the recorded lowest monthly flows, and record highest monthly flows are 2 to 8 times greater than average monthly flows. Surface water generally contains less than 130 milligrams per liter dissolved solids. Water temperature ranges from 4 deg C in January to 29 deg C in June, July, and August. (Knapp-USGS) W74-08187

WATER AVAILABILITY, COOSA COUNTY,

ALABAMA, Geological Survey, Tuscaloosa, Ala. G. C. Lines, and J. C. Scott. Alabama Geological Survey Map 111, 1972. 7 fig. 4 tab. 16 ref.

Descriptors: *Surface waters, *Groundwater, *Maps, *Alabama, Streamflow, Reservoirs, Rivers, Hydrogeology, Water quality, Water balance, Water yield, Data collections, Hydrologic

Identifiers: *Coosa County(Ala).

Surface-water supplies of 10 million gallons per day or more are available in Coosa County, Alabama, from the lower reaches of Hatchet Creek without storage and larger supplies are available from the impounded backwaters along the Coosa and Tallapoosa Rivers. Supplies of 1 the Coosa and Tanapoosa Rivers. Supplies of I million gallons per day are available from the upper reaches of Hatchet Creek, and from Weogufka, Socapatoy. Weoka, and Swamp Creeks. Ponds are used for agricultural purposes on farms which have intermittent streams and limited groundwater supplies. Surface water is of good chemical quality and is suitable for most uses. Coosa County is underlain by sedimentary, igneous, and metamorphic rocks ranging in age from Precambrian to Triassic. Rock type, depth of wells, thickness of saprolite, and topographic location all affect the availability of groundwater in the county. Supplies of 20 to 50 gallons per minute can obtained from individual wells penetrating diorite, amphibolite, chlorite schist, and schist with fractured quartz veins. The chemical quality of groundwater is generally good; however, the iron content and hardness of water are objectionable in some areas of the county. (Knapp-USGS)

SURFACE-WATER AVAILABILITY. LIMESTONE COUNTY, ALABAMA,

Listics Good Cooking Tuscaloosa, Ala. J. R. Willmon, D. M. O'Rear, and J. R. Harkins. Alabama Geological Survey Map 110, 1972, 5 fig. 1

Descriptors: *Surface waters, *Maps, *Alabama, Streamflow, Reservoirs, Rivers, Water quality, Water balance, Water yield, Data collections, Hydrologic data, Identifiers: *Limestone County(Ala).

Surface-water information for Limestone County, Alabama, is presented in a map so that a visual ap-praisal of surface-water availability and comparison with other counties can be made. The average rate of runoff for Limestone County is about 1.05 mgd square mile. The Tennessee River. the largest source of surface water in Limestone County, has an average flow of 28,800 mgd, a 7day Q2 (median annual 7-day low flow) in excess of 1,000 mgd, and storage of 1,150,000 acre-feet when Wheller Lake is at pool elevation of 556.28 feet. Elk River and Sugar, Limestone, and Piney Creeks have average flows in excess of 100 mgd and 7-day Q2 excess of 2 mgd. The chemical quality of water in streams in Limestone County is rela-tively uniform and suitable for most uses. Water temperature ranges from 3 deg C in January to 20 deg C in June, July, and August. (Knapp-USGS) W74-08189

SURFACE-WATER AVAILABILITY, ETOWAH

COUNTY, ALABAMA, Geological Survey, Tuscaloosa, Ala

J. R. Harkins. Alabama Geological Survey Map 108, 1972. 4 fig. 1 map, 1 tab, 12 ref.

Descriptors: *Surface waters, *Maps, *Alabama, Descriptors, Surface waters, Maps, Alabania, Streamflow, Reservoirs, Rivers, Water quality, Water balance, Water yield, Data collections, Hydrologic data. Identifiers: *Etowah County(Ala).

Basic information on the surface-water resources of Etowah County, Alabama, is presented in a map so that a quick visual appraisal of water availability can be made. The streams of Etowah County potentially will provide moderate to large county potentially will provide moderate to large supplies of water for municipal, industrial, and other uses. Two streams, Coosa River and Big Wills Creek, are capable of yielding 10 mgd without storage. With storage, streams draining areas in excess of 10 sq mi have the potential of yielding 10 mgd. Many sites in the county are topographically and geologically suitable for surface reservoirs. Average annual precipitation is 54 inches. Average streamflow is about 1.0 mgd per sq mi. The Coosa River has an average flow of 5,400 mgd where it enters the county and 6,200 mgd where it leaves the county. Water in the county. in general, is relatively low in total dissolved solids, is of good chemical quality, and is suitable for most uses. (Knapp-USGS) W74-08190

THE POTENTIAL APPLICATION OF SATEL-LITES IN RIVER REGULATION,

Institute of Hydrology, Wallingford (England). R. B. Painter.

Water and Water Engineering, Vol 77, No 934, p 487-491, December, 1973, 1 tab, 14 ref.

Descriptors: *River regulation, *Reservoirs, Data *Remote sensing, Cost-benefit analysis. Identifiers: *Great Britain.

Some of the problems of efficient operation of regulating reservoirs are discussed with particular reference to the measurement and transmission of data. Remote sensing systems and existing methods of transmission of ground data via satellites are described, and their potential use in river

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Control Of Water On The Surface—Group 4A

regulation is discussed. Satellites are potentially the most suitable platform for operational remote sensing, due to their capability for repeated coverage of large areas. Viability was proven by a rigorous cost/benefit comparison between a satellite based system and conventional measuring techniques. A satellite based system has the potential to be considerably cheaper than a landline based system. Whether it will be depends on many factors, such as required frequency of transmission, which might necessitate a geostationary satellite. (Merritt-FIRL) W74-08206

RELIEF CONCEPT CONCERNING MIXED SEWERS (ENTLASTUNGS-KONZEPTIONEN IM MISCHSYSTEM),
For primary bibliographic entry see Field 5D.

W74-08246

NEW ROLLER GATE IMPROVES THE RIVER WALK.

For primary bibliographic entry see Field 8A.

UTILITARIAN LEISURE FOR BURNHAM-ON-

SEA.
For primary bibliographic entry see Field 5D. W74-08262

AUTOMATED FLOW-RECORDING SYSTEM FOR FIELD DRAINAGE MONITORING--DIRECT DATA COMPILATION OF SURFACE AND SUBSURFACE DRAIN FLOW,

Agricultural Research Service, South Burlington, J. Bornstein, H. A. Preston, W. M. Winant, and G.

R. Benoit.

Journal of Agricultural Engineering Research, Vol 18, No 1, p 31-35, March, 1973. 3 fig, 4 ref.

Descriptors: *Drainage, *Flow measurement, *Data collections, Data storage and retrieval, Data transmission, Data processing, *Subsurface drainage

An automatic recording console has been developed to accept water stage data from remote weirs and flumes and store the data on magnetic tape. The sensing-transmitting-cycling-recording components can economically replace the mechanical-manual systems for converting flow events to card or tape data ready for computer analysis. A sequence of problems that had prevented operation was solved and is reported. (Skogerboe-Colorado State) W74-08267

DRAINAGE OBSERVATIONS IN LATIN AMER-

ICA, Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering. J. E. Christiansen.

Paper No 72-705 presented at Winter Meeting of the American Society of Agricultural Engineers, December 11-15, 1972, Chicago, Illinois. 4 p.

Descriptors: *Drainage, *Surface drainage, *Subsurface drainage, Tile drainage, *Salinity, Water table, Soil water movement, Saline soil. Identifiers: *South America.

Although there are many excellent irrigation systems in most of the Latin American countries, the problem of drainage and salinity generally has been neglected. There are many areas where, because of lack of adequate natural drainage, high water tables and acute salinity conditions have developed. (Skogerboe-Colorado State) W74-08268 PROBLEMS AND SCS SPECIFICATIONS FOR LOW HEAD PVC PIPELINES,

Soil Conservation Service, Bozeman, Mont. For primary bibliographic entry see Field 8B. W74-08278

CENTER PIVOT PROBLEMS.

For primary bibliographic entry see Field 3F. W74-08283

For primary bibliographic entry see Field 3F. W74-08284

FLOODFLOWS FROM SMALL DRAINAGE AREAS IN OKLAHOMA: PROGRESS REPORT

AND DATA COMPILATION, Geological Survey, Oklahoma City, Okla. For primary bibliographic entry see Field 2E. W74-0829

MONITORING FLOOD DAMAGE WITH SATELLITE IMAGERY,

South Dakota State Univ., Brookings. Remote Sensing Inst.

Sensing Inst.
L. A. Benson, and F. A. Waltz.
Available from NTIS, Springfield, Va. 22151,
N73-21361 - Price \$3.00 printed copy; \$1.45
microfiche. Interim Report 73-07, March 1973. 11
p, 5 fig, 3 ref. NASA Contract NGL 42-003-007.

Descriptors: *Remote sensing, *Floods, *Satellites(Artificial), *Land use, Water injury, Damages, *Flood damage.
Identifiers: ERTS.

During analysis of ERTS-1 imagery for land-use patterns a large impoundment of water was observed in a location that was normally farmland. Subsequent investigation revealed that the satellite had recorded the remaining floodwaters from a severe local rainstorm that had occurred four days prior to the overpass. The inundated area was measured using an automatic planimeter. The area measurement coupled with estimates of the land use and productivity of the region permitted an estimate of the crop damage loss for the inundated area. (Knapp-USGS) W74-08294

A DETAILED PROCEDURE FOR THE USE OF SMALL-SCALE PHOTOGRAPHY IN LAND USE CLASSIFICATION,

National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.

Production, 1ex. Dynam B. Johnson Space Center.
P. L. Vegas.
Available from NTIS, Springfield, Va. 22151,
NASA TN D-7542 - Price \$3.00 printed copy; \$1.45
microfiche. Technical Note D-7542, March 1974.
38 p, 3 fig, 7 tab, 1 ref, 3 append.

Descriptors: *Mapping, *Land use, *Aerial photography, Satellites(Artificial), *Land classification, Urbanization, Farms, Forests, Wetlands, Grasslands, Highways.

A procedure was developed to produce accurate land use maps from available high-altitude, smallscale photography. Land use classification maps are constructed from small-scale photographs by using 12 basic land use categories and 6 subcategories, or a total of 18 categories. The basic and alternative procedures were tested over a six-county area and in demonstration projects. The most sig-nificant single feature of the procedure is the capanificant single feature of the procedure is the capa-bility to produce a final product in a relatively short time, usually within 60 to 90 days after receipt of data. In addition, the procedure can be accomplished with the skills and types of person-nel normally available on the staffs of local planning agencies. The personnel skills required are photointerpreters and draftsmen. The equip-ment required consists of standard light tables, 9to 10-power stereoscopes, and standard drafting supplies. The photographic processing service and supplies can be provided by commercial firms in most large cities. (Knapp-USGS) W74-08299

SALINE-SEEP DEVELOPMENT IN DRYLAND

SOILS OF NORTHEASTERN MONTANA, Agricultural Research Service, Sidney, Mont. For primary bibliographic entry see Field 3C. W74-08300

PUNALUU-HAUULA AREA, FLOODS IN OAHU, HAWAII,

Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C. W74-08310

OPERATION AND MAINTENANCE OF IR-RIGATION AND DRAINAGE SYSTEMS: SEC-TION III-OPERATION. American Society of Civil Engineering. New

York. Committee on Operation and Maintenance

of Irrigation and Drainage Systems.

Journal of the Irrigation and Drainage Division,
American Society of Civil Engineers, Vol 99, No
IR3, p 237-338, September, 1973, 36 fig. 28 ref.

Descriptors: *Drainage, *Drainage systems, *Irrigation, *Irrigation systems, *Operation and maintenance, Water distribution(Applied), *Water *Drainage, *Drainage systems, management(Applied), Water reuse.

The subject of operation is treated by a discussion of the factors essential to good water management on an irrigation and drainage system; the staff necessary to accomplish the work and its responsibility; operating practices and procedures for the handling, movement, disposal or reuse of water; and the value of good records and communications in these operations. The irrigation system referred to is that generally referring to movement of water from its source to the user, and is that system prevalent in arid and semiarid areas as well as in humid areas. The use of the term drainage system refers to systems in which removal of excess surface water seasonally is normally a necessity. (Skogerboe-Colorado State) W74-08318

WOODY PHREATOPHYTES ALONG THE COLORADO RIVER FROM SOUTHEAST RUNNELS COUNTY TO THE HEADWATERS IN BORDEN COUNTY, TEXAS,

Geological Survey, Austin, Tex. For primary bibliographic entry see Field 3B. W74-08371

HYDRODYNAMICS OF SURFACE IRRIGA-

TION-ADVANCE PHASE, California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-08384

FLOOD CONTROL AND WATER CONSERVA-TION WORKS IN BUKIT TIMAH CATCHMENT, SINGAPORE, SINGAPORE Designed by Market

Singapore Dept. of Public Works. Drainage and Marine Branch.

Marine Branch.

D. Chow Siong Keng, and Chang Kin Koon.

In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 26-43, 1972.

10 Fig. 12 of 10 fig. 13 ref.

Descriptors: *Flood control, *Water resources development, *Reservoirs, Canals, Water storage, Water supply, Runoff, Hydrographs, Water con-servation, Drainage.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

Identifiers: *Singapore.

Land drainage works in the Bukit Timah Catchment in the south-central area of the Island of Singapore were constructed to achieve the dual objectives of flood control and water conservation for water supply. The works consist of three stages: diversion, improvement of existing chan-nels, and a reservoir. The flood alleviation schemes and drainage improvement works are implemented in conjunction with land development. More than 70% of the land area or about 147 sq mi in the Island is rural area. (See also W74-08454) (Knapp-USGS)

HYDROLOGICAL ACTIVITIES IN SIN-GAPORE.

Singapore Dept. of Public Works. Drainage and Marine Branch. For primary bibliographic entry see Field 7C.

W74-08457

DEVELOPMENT OF WATER SUPPLY IN VIET-

Ministry of Health, Saigon (Vietnam). Environmental Sanitation Service.

For primary bibliographic entry see Field 5G. W74-08460

IMPROVED WATER MANAGEMENT FOR PADDY RICE PRODUCTION IN THE PHILIP-PINES.

Irrigation Administration, (Philippines). Water Management Project. For primary bibliographic entry see Field 3F. W74-08464

RATIONAL USE OF WATER, Ministry of Public Works and Electrical Energy, Djakarta (Indonesia). Water Resources Development.

For primary bibliographic entry see Field 6B. W74-08466

IMPROVEMENT OF SOIL COVER FOR WATER CONSERVATION, PREVENTION OF SEDIMENTATION AND POLLUTION CONTROL IN THE PHILIPPINES, National Inst. of Science and Technology, Manila (Philippines). Div. of Agriculture and Natural

Resources Research.

For primary bibliographic entry see Field 5G.

EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL. VTN, Orlando, Fla.

For primary bibliographic entry see Field 5E. W74-08486

A GUIDE TO NATURAL RESOURCE INFOR-

MATION OF GEORGIA.
Georgia Dept. of Natural Resources, Atlanta.
For primary bibliographic entry see Field 10C. W74-08487

FLOOD PLAIN INFORMATION; GRANTS CREEK - TOWN CREEK, CITY OF SALISBU-RY, NORTH CAROLINA.
Army Engineer District, Charleston. S.C.

June, 1973. 24 p. 11 fig. 39 plates, 7 tab, glossary.

Descriptors: *Flood data, *Design flood, *Regional flood, Flood damage, Peak discharge. *Flood forecasting, Overflow, Flood profiles, Floodwater, Historic floods, *North Carolina, *Data collections.

Identifiers: Grants Creek(N.C.), Creek(N.C.), Salisbury(N.C.).

streams is primarily undeveloped, although land use varies from concentrated residential and commercial development to farm and wooded land. Given the present state of development, an Intermediate Regional Flood would inundate 1.67 square miles along Grants Creek, .03 square miles of which is developed (affecting 19 structures) and 76 square miles along Town Creek, of which .06 square miles is developed (affecting 80 structures). As this land comes under pressure for future development, the impact of flooding will increase. Peak flows along selected points on Grants Creek range from 13,500 to 19,900 cfs during an Inter-mediate Regional Flood and from 22,200 to 30,600 cfs during a Standard Project Flood. Peak flows along selected points in Town Creek range from 2,700 to 6,000 cfs during an Intermediate Regional Flood and from 4,200 to 9,750 cfs during a Standard Project Flood. Underclearance elevation. lowest elevation of roadway, and water surface elevation during Intermediate Regional and Standard Project Floods are detailed for all bridges and culverts. Overflow areas are delineated on maps of the area. Water surface profiles of the Inter-mediate Regional and Standard Project Floods are also included. (Hoffman-North Carolina)

Grants Creek and Town Creek straddle the town

of Salisbury, North Carolina. Property along the

FLOOD PLAIN INFORMATION; PETERS CREEK AND LICK RUN, ROANOKE, VIR-

Prepared for the Roanoke Valley Regional Planning Commission by the Army Corps of Engineers, Wilmington District, N.C. August, 1968. 33 p, 5 fig, 11 plates, 10 tab, glossary.

Descriptors: *Flood data, *Design flood, *Regional flood, Flood damage, *Virginia, Peak discharge, *Flood forecasting, Historic floods, Overflow, Floodwater, Flood profiles, *Data col-

Identifiers: Peters Creek(Va), Lick Run(Va.). Roanoke(Va.)

Both commercial and residential developments lie within the flood plains along Peters Creek which flows along the western corporate limits and empties into the Roanoke River, and Lick Run which flows through the heart of the business district and empties into Tinker Creek at the eastern corporate limits. Portions of this land have been inundated by floods of the past and a substantially greater area is within reach of the potentially greater floods of the future. Areas which would be flooded during Intermediate Regional and Stan-dard Project Floods are delineated on maps. Approximately 92 structures in the stream reach studied would be flooded by an Intermediate Re-gional Flood, while a Standard Project Flood would reach approximately 123 structures. During a Standard Project Flood, stream velocities in the channel would range up to 14 feet per second on both Peters Creek and Lick Run. Duration of floods is relatively short on both streams. During the Standard Project Flood on Peters Creek the stream would rise 11 feet in 7 hours with a maximum rate of rise of 2.5 feet per hour and would remain out of banks for about 9 hours. On Lick Run, the Standard Project Flood would rise 13 feet in 6 hours with a maximum rise of 3 feet per hour. The stream would remain out of banks for about 7 hours. During an Intermediate Regional Flood, flood crests would reach 4,850 cfs on Peters Creek and 3,700 cfs on Lick Run. Peak discharge during a Standard Project Flood would be 7,900 cfs on Peters Creek and 5,240 cfs on Lick Run. (Hoffman-North Carolina) W74-08491

THE SEVIER COUNTY WATER PLAN,

Tennessee Dept. of Conservation, Nashville. Div. of Water Resources. For primary bibliographic entry see Field 6D.

SYSTEMS PLANNING DESIGN: CASE STUDIES MODELING, OPTIMIZATION, IN MODELII
EVALUATION. Massachusetts Inst. of Tech., Cambridge. Center

for Transportation Studies. For primary bibliographic entry see Field 6A. W74-08506

SYSTEMS ANALYSIS OF LARGE-SCALE PUBLIC FACILITIES: NEW YORK CITY'S WATER SUPPLY NETWORK AS A CASE STUDY.

Massachusetts Inst. of Tech., Cambridge. Center for Transportation Studies. For primary bibliographic entry see Field 3D.

W74-08507

ECONOMICS OF INLAND WATER TRANS-

Peat, Marwick, Mitchell and Co., Washington.

J. F. Hoffmeister, III, and R. de Neufville. In: Systems Planning and Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D. H. Marks), Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 61-79 (Chapter 6), 1974. 12 fig, 1 tab, 10 equ, 11 ref.

Descriptors: *Inland waterways, *Transportation, *Water supply, *Economic efficiency, *Design, Barges, Optimization, Economic prediction, Marginal return, Return to scale, Rivers, Cur-rents(Water), Demand, Streams, Constraints, Physical properties, Costs, Size, Channel, Depth. Width, Equations, Operations research.
Identifiers: Production function, *Towboats, Isoquants, Tradeoffs, Flotilla, Power, Tonnage,

Horsepower, Expansion path.

Ultimately, design optimization of any transportation systems requires joint consideration of supply and demand. Often, however, a planner cannot foresee demands accurately; thus, he must know his supply possibilities so he can focus on a narrow set of appropriate alternatives. Optimal configurations for supplying inland water transport are defined. A production function is developed (by reference to physical measurements) and explored. The production function itself is plored. The production function itself is represented by means of its isoquants or contours of equal output. Expansion paths are the loci of optimal design for specific set of economic circumstances and, specifically, of costs for several inputs. Examined are the existence of diminishing marginal returns, returns to scale, the effects of stream currents, and the effects of constraints such as a maximum limit on the length of the barge flotilla. The effect of stream current is to distort the isoquants of the production function in favor of increased horsepower. Returns to scale are shown to vary according to the nature of the waterway. Generally, the effect of diminishing marginal returns, and decreasing returns to scale associated with the constraints, is to yield a convex feasible region for output, for which it is possible to find specific optimal designs. The analysis focuses on the use of relatively shallow draft towboats and barges. Results show the supply of water transport is characterized by diminishing marginal returns and increasing returns to scale (See also W74-08506) (Bell-Cornell)

THE COMBINED USE OF OPTIMIZATION AND SIMULATION MODELS IN RIVER BASIN PLANNING.,

Massachusetts Inst. of Tech., Cambridge. Sloan School of Management.

W74-08508

H. D. Jacoby, and D. P. Loucks. In: Systems Planning and Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D.H. Marks), Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 237-256 (Chapter 17), 1974. 2 fig, 1 tab, 27 equ, 15 ref.

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Control Of Water On The Surface—Group 4A

Descriptors: *Optimization, *Simulation analysis, *River basins, *Planning, *Computer programs, *Delaware River, Digital computers, Alternative planning, Mathematical models, Systems analysis.

Simulation models have proved to be extremely useful in aiding river basin planning. However, all suffer a common difficulty, since the analyst himself must formulate the physical design to be stu-died in each computer run. If the basin is large and offers a variety of development opportunities, the number of alternative system plans from which he must choose can be extremely large. Reported is an investigation of the use of analytical optimiza-tion models to 'screen' the set of possible plans and to select a small number worthy of simulation analysis. Deterministic and stochastic optimiza-tion models have been developed and applied to both static and dynamic (multiperiod) planning problems; the Delaware River basin is used as an example. The resulting designs have been analyzed by using a large-scale digital simulation model of the basin so that the ability of the screening models to identify high-valued alternatives can he evaluated. In this context the results indicate considerable promise for the combined use of optimization and simulation models. (See also W74-08506) (Bell-Cornell) W74-08512

DETERMINATION OF THE DISCHARGE POL-ICY FOR EXISTING RESERVOIR NETWORKS,

Hydro-Quebec, Montreal. G. Leclerc, and D. H. Marks.

Systems Planning Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D.H. Marks), Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 257-272 (Chapter 18), 1974. 4 fig, 6 tab, 25 equ, 3 ref.

Descriptors: *Multiple-purpose reservoirs, Net-Descriptors: "Multiple payagement works, "Linear programming, "Reservoir releases, Discharge(Water), "Drawdown, Managereleases, Discharge(Water), "Costs, Design, "Canada, ment, Optimization, Costs, Design, *Canada, Economics, Recreation, Water supply, Streamflow, Rivers, Constraints, Reservoir capacity, Systems analysis, Mathematical models, Stochastic processes, Digital computers

Identifiers: *Discharge policy, Operating policy, *Riviere du Nord(Quebec-Canada), Chance-constrained programming, Screening, Cost minimiza-

Optimization models are used to examine the question of operating a small existing reservoir system to meet various conflicting objectives that are not easily quantifiable in commensurate units. For existing reservoirs, an efficient policy implies maximization of the magnitude of the streamflow guaranteed at a given reliability level. Using a linear programming screening model, the discharge policy for a network of eight small exist-ing reservoirs utilized for recreational activities and for water supply of a city downstream of the network is determined. The optimization problem is formulated by employing a linear operating rule, and chance-constrained programming is adopted to account for the stochasticity of the inflows. Two objective functions are introduced to study the cost of a more 'equitable' distribution of the losses due to surface drawdowns versus the most efficient, which minimizes the total summation of the individual drawdowns; comparison of the solutions leads to quantification of the additional cost that society has to pay for a discharge policy that is equitable rather than efficient. A case study on the Riviere du Nord, Quebec, Canada is presented. Results show that the linear operating rule is valid for existing reservoir analysis; ob served also is that chance-constrained gramming may have serious ineptitudes for design purposes and for analysis of large existing reservoir networks. The approach, however, is a desira-ble management tool for systems of small reservoirs, primarily as a screening model. (See also W74-08506) (Bell-Cornell) W74-08513

MULTIOBJECTIVE ANALYSIS IN WATER RESOURCE PLANNING, Johns Hopkins Univ., Baltimore, Md. Dept. of En-

vironmental Engineering.
J. L. Cohon, and D. H. Marks.

In: Systems Planning and Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D.H. Marks), Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 304-321 (Chapter 21), 1974. 4 fig, 3 tab, 16 equ, 16 ref.

Descriptors: *River basin development, *Comprehensive planning, *Regional analysis, *Linear programming, *Economic efficiency, *Resource allocation, Resources development, *Multiple-purpose projects, Decision making, Optimization, Alternative planning, Co Mathematical models, Systems analysis. Constraints.

Identifiers: Multiobjective analysis, Screening models, Environmental quality, Water resource investment, National objectives, Income benefits,

Social welfare

This study demonstrates how many planning objectives can be integrated into optimization ontimization models. An application of multiobjective theory to the analysis of development alternatives for a large-scale river basin is presented. A river and its uses represent a complex stochastic physical system embedded in an economic, social, and in-stitutional framework difficult to model. A screening model endeavors to model analytically the interrelated decision in the context of this physical and nonphysical environment. Such a model solves an optimization problem which maximizes net discounted benefits subject to continuity constraints on water flow, technological constraints on the alternatives, and policy constraints. Presented is a case study of a river system in which development is to be planned according to national and regional objectives. The two planning objectives considered are: net national income benefits and preservation of environmental quality. A linear programming screening model for finding the best set of development alternatives from a national objective point of view is introduced and a brief discussion of methods for handling more than one objective in such models is presented. An analysis of the trade-offs between the two objectives is demonstrated by using a constraintmethod. The transformation curve between net national income benefits from power and irrigation and regional equity as measured by deviation from an equal regional water distribution is shown. (See also W74-08506) (Bell-Cornell) W74-08514

MULTIOBJECTIVE REDESIGN OF THE BIG WALNUT PROJECT, Massachusetts Inst. of Tech., Cambridge. Dept. of

Civil Engineering.

D. C. Major.

In: Systems Planning and Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D. H. Marks), Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 322-337 (Chapter 22), 1974. 5 fig, 2 equ, 11 ref.

Descriptors: Water resources development, *Multiple-purpose projects, *Design, *Economic efficiency, *Cost-benefit analysis, Evaluation, efficiency, *Cost-benefit analysis, Evaluation, *Planning, National income, Conservation, *Indiana, Dams, Reservoirs, Flood control, Vater analytic control. Recreation, Water supply, Water quality control, Optimization, Estimating, Systems analysis, Mathematical models.

Matternation (Market State), Multiobjective analysis, Redesign, Environmental quality, Wabash River Basin(Ind.), Bluffs, Transformation

Multiobjective analysis is a generalization of tradi-tional efficiency-oriented benefit-cost analysis; it allows recognition of many planning objectives, many of which have often heretofore been ignored or given secondary consideration, such as regional development for example. Herein, multiobjective

analysis is applied to the redesign of a water resource project, the proposed Big Walnut dam and reservoir in Indiana, which was previously designed by conventional techniques. The formulation of the project in terms of relevant multiob-jectives requires: (1) choice of pertinent objectives; (2) analysis of preferences of different in-terest groups; and (3) development of a transfor-mation curve which shows the frontier of tradeoffs between objectives. These are discussed consecutively and in detail. The primary objectives for reformulation of the Big Walnut project are increasing national income and improvement of environmental quality. Planning preferences of the Corps of Engineers, who are opting to maximize national efficiency benefits, differ from those of the conservationists. A transformation curve is derived which shows the maximum combinations of net income and ecological areas saved. An estimate is made of the optimal efficiency allocation of each level of storage at the Dig Walnut site to each of the system outputs: flood allocation of each level of storage at the Big control, recreation, and water supply and water quality control. The transformation curve is only illustrative; a more thorough study of all information for estimating both efficiency and environmental benefits and costs should be made. probably using simulation to capture the highly stochastic nature of the system. (See also W74-08506) (Bell-Cornell) W74-08515

PORT EVERGLADES HARBOR, BROWARD COUNTY, FLORIDA (FINAL ENVIRONMENTAL STATEMENT).

Army Engineer District, Jacksonville, Fla. For primary bibliographic entry see Field 8A. W74-08518

SPUR CHANNEL TO ASTORIA WATER-FRONT, EAST RIVER, NEW YORK (FINAL EN-VIRONMENTAL STATEMENT).

Army Engineer District, New York. For primary bibliographic entry see Field 8A. W74-08519

OPERATION AND MAINTENANCE OF NEW BEDFORD HURRICANE BARRIER (FINAL EN-VIRONMENTAL STATEMENT).

New England Div. Corps of Engineers, Waltham,

For primary bibliographic entry see Field 8D. W74-08520

LOWER RIO GRANDE FLOOD CONTROL PROJECT, TEXAS.

International Boundary and Water Commission, For primary bibliographic entry see Field 8A. W74-08521

WATER RESOURCES COUNCIL REPORT ON THE PEARL RIVER COMPREHENSIVE BASIN STUDY MISSISSIPPI AND LOUISIANA.

Water Resources Council, Washington, D.C. Available from the National Technical Informa-tion Service, Springfield, Va. 22151, as EIS-MS-73-1758-F, for \$5.25 paper copy; \$1.45 microfiche. May 1972. 47 p, 1 map.

Water resources development, management, *River basins, Descriptors: "Watershed management, "River basins, "Multiple purpose reservoirs, "Flood protection, "Environmental effects, Flood routing, Flood plain zoning, "Mississippi, "Louisiana, Area redevelopment, Recreation, Non-structural alternatives, Land resources, Water resources.

Identifiers: *Environmental impact statement, Pearl River(Miss).

The effect of a proposed basin-wide program in the Pearl River Basin in Mississippi and Louisiana is examined. The Pearl River Basin Coordinating

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Group 4A—Control Of Water On The Surface

Committee provided guidance for this proposal from the Water Resources Council (WRC). Both plans are compared and discussed in detail. Projections of increased population growth and economic activity provide the basis for formula-tion of the plan for development of the basin. Needs include both water and related land resources development and many areas need pro-tection from recurring floods. Flood control storage in both upstream and downstream areas is shown as the best solution to this problem. The WRC plan includes three multiple purpose reservoirs, various land treatment measures, and development of a long recreational boatway, as well as several nonstructural methods. The plan would result in reduction in flooding, permanent inundation of land, reduction in erosion, reduced nutrient flows, probable upgrading of water use classification, and a change from a free flowing stream environment to a lake environment. It would adversely affect about 10,000 acres of farm and forest wildlife habitat, disrupt aquatic and streambank terrestrial ecosystems and 52,000 acres of bottomland forest would have to be cleared. (Sutton-Florida) W74-08522

BOUNDARY AND LAND DEVELOPMENT REGULATION RECOMMENDATIONS FOR THE BIG CYPRESS AREA OF CRITICAL STATE CONCERN.

Florida Bureau of Land Planning, Tallahassee. October 1973, 1 p. 1 map, 2 append.

Descriptors: *Florida, *Water resources development, *Land management, Legislation, Administration, Planning, State jurisidetion, Water conservation, Swamps, *Regulation, Ecology, Land resources, Parks, Legal aspects. Identifiers: *Big Cypress(Fla).

Under the 1973 Florida Big Cypress Conservation Act the Division of State Planning was directed to recommend a definitive boundary and land development regulations for the Big Cypress Area of Florida to the Administrative Commission. Included in this summary of the project are a map and a legal description of this area as well as proposed land development regulations aimed at protecting the vital water resources within the Big Cypress Critical Area. (Whisler-Florida) W74-08543

NAVIGATION AND NAVIGABLE WATERS--FLOOD CONTROL REGULATIONS.

Federal Register, Vol 37, No 16, p 1106, 1107, January 25, 1972. 2 p.

Descriptors: *Kansas, *Administrative agencies, *Dams, *Water control, *Flood control, Civil engineering, Flow control, Water storage, Federal government, Flow rates, Water control.

The storage capacity allocated for flood control purposes in Waconda Lake by the operation of Glen Elder Dam on the Solomon River in Kansas in governed by this regulation. The Bureau of Reclamation, Department of Interior, is given the power to regulate the Glen Elder Dam in the interest of flood control. Flood control storage space between elevations 1455.6 and 1488.3 are to be regulated for flood control on the Solomon and Smokey Hill Rivers. The objective is to limit flow in th Solomon River to 7,500 cubic feet per second and to limit flow in the Smokey Hill River to 25,000 cubic feet per second. (Flowers-Florida) W74-08551

SELECTIVE WITHDRAWAL FROM MAN-MADE LAKES, Army Engineer Waterways Experiment Station,

Army Engineer Waterways Experiment Station Vicksburg, Miss. Hydraulics Lab.

J. P. Bohan, and J. L. Grace, Jr. Available from NTIS, Springfield, Va 22151 as AD-757 595, price \$3.00 printed copy; \$1.45 in microfiche. Army Engineer Waterways Experiment Station Technical Report H-73-4, March 1973. 51 p, 9 fig, 25 plate, 12 ref.

Descriptors: *Stratified flow, *Density stratification, *Reservoir releases, Water quality control, *Withdrawal, Reservoir operation, Hydraulic models

Identifiers: Selective withdrawal.

Withdrawal-zone characteristics created in a randomly density-stratified impoundment were studied by releasing flow through a submerged orifice, over a free and submerged weir, or through a combination of these. Generalized relationships were developed for describing the vertical limits of the withdrawal zone and the vertical velocity distribution within the zone. Techniques were developed for handling conditions in which the water surface or bottom boundary controlled the limits of the withdrawal zone and for describing the composite velocity profile resulting from withdrawal zones which overlapped. If the velocity profile and the reservoir width are known, a vertical flow rate distribution can be determined. This flow rate distribution can then be applied as a weighting function to the reservoir profile of any water-quality parameter to determine its value in the reservoir release. (Knapp-USGS) W74-08585

ESTIMATING LOW-FLOW FREQUENCY FOR PERENNIAL MISSOURI OZARKS STREAMS, Geological Survey, Rolla, Mo.

J. Skelton.

Available from NTIS, Springfield, Va. 22151, as PB-229 617/AS, Price \$3.00 printed copy; \$1.45 microfiche. Water-Resources Investigations 59-73, February 1974. 19 p., 4 fig. 2 tab, 5 ref.

Descriptors: *Low flow, *Missouri, *Statistical models, *Regression analysis, Streamflow forecasting.
Identifiers: *Ozarks region(Missouri).

A linear regression model utilizes as an independent variable the flow area of a stream. The model was developed for use in estimating minimum streamflow at ungaged sites in the Ozarks region of Missouri. Low-flow characteristics at any point on perennial Ozarks streams are significantly related to the average width and depth or flow area of the minimum flows. (Knapp-USGS) W74-08599

FINAL ENVIRONMENTAL STATEMENT, WEST TERRE HAUTE LEVEE, WABASH RIVER, INDIANA, WABASH RIVER BASIN. Corps of Engineers, Louisville, Ky. For primary bibliographic entry see Field 8D. W74-08660

4B. Groundwater Management

OPTIMIZATION OF THE ASSIMILATIVE WASTE CAPACITY OF THE UNSATURATED AND SATURATED ZONES OF AN UNCONFINED AQUIFER SYSTEM,

Univ., of California, Los Angeles. School of Engineering and Applied Science. For primary bibliographic entry see Field 5B. W74-08152

PROBABILISTIC MODELS IN THE DESIGN AND OPERATION OF A MULTI-PURPOSE RESERVOIR SYSTEM,

Univ., of California, Los Angeles. Dept. of Engineering Systems. For primary bibliographic entry see Field 4A. W74-08153 GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS: PART III. MORE ON POLLUTION FROM WELLS.

Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.

W74-08184

W74-08276

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS.

Environmental Protection Agency, Washington, D.C. Office of Air and Water Program. For primary bibliographic entry see Field 5. W74-08185

INVESTIGATIONS OF THE RESPONSE OF AN UNCONFINED AQUIFER TO LOCALIZED RECHARGE,

Maryland Univ., College Park. Dept. of Civil Engineering. For primary bibliographic entry see Field 2F.

INTERSTATE AND INTERNATIONAL AOUIFERS.

Bittinger (M.W.) and Associates, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 6E.

GROUND WATER QUALITY EFFECTS ON DOMESTIC WATER UTILIZATION, Univ. of Alaska College. Inst. of Water Resources.

Univ. of Alaska College. Inst. of Water Resource For primary bibliographic entry see Field 5B. W74-08287

IDENTIFICATION AND CONTROL OF POLLUTION FROM SALT WATER INTRUSION.

Environmental Protection Agency, Washington, D.C. Div. of Water Quality and Non-Point Source Control.

For primary bibliographic entry see Field 5B. W74-08293

RECORDS OF WATER WELLS, SPRINGS, OIL-AND GAS-TEST HOLES, AND CHEMICAL ANALYSES OF WATER FOR THE MADISON LIMESTONE AND EQUIVALENT ROCKS IN THE POWDER RIVER BASIN AND ADJACENT AREAS, NORTHEASTERN WYOMING.

Geological Survey, Cheyenne, Wyo. W. G. Hodson.

Cooperative Data Report, 1974. 26 p. 1 fig. 3 tab. 4 ref.

Descriptors: *Hydrologic data, *Wyoming, *Water wells, *Aquifers, *Data collections, Drillers logs, Borcholes, Springs, Water quality. Groundwater basins.

Groundwater basins.
Identifiers: *Madison Limestone, *Powder River basin(Wyo).

Records of 56 water wells and springs developed in the Madison Limestone in the Powder River basin of Wyoming, 222 water wells and oil- and gas-test holes that reached the Madison, and 71 chemical analyses of Madison waters are tabulated in three tables. (Knapp-USGS)

PROBLEMS ARISING FROM OVER EX-PLOITATION OF THE NATURAL WATER RESERVOIR IN THE URBAN DISTRICT OF MILAN (I PROBLEMI POSTI DAL SOVRAS-FRUTTAMENTO IDRICO DEL SERBATOIO NATURALE NELLA CONURBAZIONE MILANESE), S. Mazzarella

Inquinamento, Vol 15, No 6, p 25-34, August 1973.

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Groundwater Management—Group 4B

Descriptors: *Groundwater management, *Water resources, *Water table, Cities, Reservoirs, *Industrial water, *Municipal water, Exploitation, Withdrawal, Drawdown. Identifiers: *Italy(Milan).

Problems arising from the overexploitation of the natural groundwater resources in the urban and industrial districts of Milan are described, and solutions to this problem are proposed. The ever increasing industrial activity, and especially the concentration of large water consuming industries in a limited area in and around Milan has resulted in a steady, considerable lowering of the water table. The phreatic layer has lowered, in one district of Milan, from about 6 m in 1934 to 41 m in 1971. The industries settled in the Milan area draw from available water supplies in an uncontrolled manner. The volume of the water drawn for municinal use has not increased at the same rate as the population. It is recommended that the major industries responsible for the lowering of the groundwater table in the Milan area should be required to adopt adequate techniques for water recycling to reduce their water consumption, and to use surface wells for water capture. They may be allowed to use water from deep layers of transi tional and marine sediments in a controlled manner. It is further recommended that industries with high potential water consumption should no longer be allowed to settle in the Milan area. (Merritt-FIRL) W74-08354

A VESSEL FOR COLLECTING SUBSURFACE WATER SAMPLES FROM GEOTHERMAL DRILLHOLES, Department of Scientific and Industrial Research,

Department of Scientific and Industrial Research, Wairakei (New Zealand). Chemistry Div.

Geothermics, Vol 2, No 2, p 57-60, June 1973. 4 fig, 2 tab, 2 ref.

Descriptors: *Sampling, *Geothermal studies, *Geochemistry, Water chemistry, Thermal water, Boreholes, Equipment. Identifiers: Borehole samplers.

A sampler for geothermal studies features a breakoff tube sealed in series with a non-return valve. During downhole tests the vessel was successfully operated at temperatures up to 300 deg C and pressures up to 150 atm. It remained uncorroded by waters ranging in salinity from 1500 to 300,000 mg/kg sodium chloride, and with pH as low as 2.5. (Knapp-USGS) W74-08366

GROUNDWATER LEVELS IN NEBRASKA,

Geological Survey, Lincoln, Nebr.

M. J. Ellis.

Nebraska Water Survey Paper No 36, May 1974. 106 p, 11 fig, 1 tab, 20 ref.

Descriptors: *Basic data collections, *Water levels, *Groundwater, *Nebraska, Hydrologic data, Data collections, Well data.

In Nebraska during 1973 more than 3,200 water-level measurements were made in 1,260 observation wells. These data, together with more than 5,000 water-level measurements from 63 wells equipped with automatic recorders and about 1,550 water-level measurements made in 422 wells were entered into computer storage. This report contains data on the 1973 fall water levels for 708 selected wells. Records of any water-level measurements in these wells at other times of the year and water-level data for other observation wells in the state are also available. (Knapp-USGS) W74-08367

STOCHASTIC ANALYSIS OF GROUNDWATER LEVEL TIME SERIES IN THE WESTERN UNITED STATES, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering.
For primary bibliographic entry see Field 2F.

GROUND-WATER RESOURCES OF DUVAL COUNTY, TEXAS,

COUNTY, TEXAS, Geological Survey, Austin, Tex

Georgical surfey, Austri, 1ex.
G. H. Shafer.
Texas Water Development Board Report 181,
March 1974. 117 p, 22 fig, 11 tab, 30 ref.

Descriptors: *Groundwater, *Texas, Water quality, *Hydrologic data, Water resources, Water wells, Water yield, Data collections, Artesian aquifers, Hydrogeology. Identifiers: *Duval County(Tex).

The geologic formations that yield fresh to moderately saline water in Duval County, Texas are the Catahoula Tuff, Oakville Sandstone, and Goliad Sand. All other geologic formations underlying the county are not known to yield water to wells or they yield only saline water. About 5.3 mgd of groundwater was used in 1970. Of this amount 0.6 mgd was pumped from the Catahoula Tuff, 0.7 mgd from the Oakville Sandstone, and 4.0 mgd from the Goliad Sand. Most of the large groundwater supplies are obtained from wells in the Goliad Sand. During 1931-69, water levels declined as much as 55 feet in the artesian zone of the Goliad Sand in the east-central and southeastern parts of the county, as a result of pumping for irrigation, public supply, and industrial use. Changes in water levels in wells in the Catahoula have been relatively small. Probably only slight changes in water levels have occurred re-gionally in the Oakville Sandstone. The ground-water is characteristically high in dissolved solids, chloride, and hardness. Most of the water sampled does not meet the quality standards of the U.S. Public Health Service for drinking water. Water from the Goliad Sand is more suitable for irrigation than water from the Oakville Sandstone and Catahoula Tuff; however, water from any of the three aquifers should be used with careful management and as a supplement to rainfall. The groundwater resources of the county are only partly developed. A total of 23 mgd (6 mgd from the Catahoula, 7 mgd from the Oakville, and 10 mgd from the Goliad) of fresh to slightly saline water is available on a long-term basis without depleting the supply. This total is slightly more than four times as much water as was used for all purposes in 1970. (Knapp-USGS) W74-08372

TRANSIENT RESPONSE OF A LAYERED, SLOPING SOIL TO NATURAL RAINFALL IN THE PRESENCE OF A SHALLOW WATER TABLE: EXPERIMENTAL RESULTS,

Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center. For primary bibliographic entry see Field 2A. W74-08375

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1970-74.

Geological Survey, Denver, Colo. W. E. Hofstra, and T. J. Major. Colorado Water Resources Basic-Data Release No 33, 1974, 36 p. 1 fig. 1 tab.

Descriptors: *Basic data collections, *Water levels, *Groundwater, *Colorado, Hydrologic data, Data Collections, Well data. Identifiers: *High Plains(Colo).

Water-level measurements were made during the winter prior to the 1974 irrigation season in more than 1,000 wells in the northern High Plains of

Colorado. Measurements for the 4 preceding winters are also included to serve as references illustrating declining or rising water levels. The 9,500 square-mile area includes all or part of 11 counties. Irrigation supplies are derived almost entirely from wells tapping the Ogallala Formation. The Ogallala, of Pliocene and locally of Miocene age, consists of sand, gravel, silt, and clay, and ranges in thickness from a few feet on the west to as much as 400 feet in places near the eastern State line. (Knapp-USGS) W74-08381

APPRAISAL OF THE WATER RESOURCES OF EASTERN PALM BEACH COUNTY, FLORIDA,

Geological Survey, Tallahassee, Fla. L. F. Land, H. G. Rodis, and J. J. Schneider. Florida Bureau of Geology Report of Investigations No 67, 1973. 64 p. 40 fig. 5 tab, 21 ref.

Descriptors: *Water resources, *Florida, *Groundwater, Surface-groundwater relationships, Water pollution, Water quality, Hydrogeology, Municipal water, Hydrologic data. Identifiers: *Palm Beach County(Fla).

Rapid population growth in the eastern coastal areas of Palm Beach County, Florida, places in-creasing demands on the water resources of the area and locally has created critical problems. Groundwater from the shallow aquifer, a hydrologic unit including the Biscayne, Pamlico and Anastasia Formations, underlies the entire area and is the principal source of water for most uses. Specific capacities of municipal wells range from about 10 to more than 350 gallons per minute per foot of drawdown. Municipal pumping averaged about 75 million gallons per day during 1970. West Palm Beach is the only community which uses surface water for municipal supply. Several municipal well fields are beset with problems of saltwater intrusion caused by increas-ing pumpage during droughts. Total dissolved solids of the freshwater in the shallow aquifer system ranges from 200 to 300 mg/liter in the coastal ridge to more than 500 mg/liter in the western areas. The dissolved-solid content of the surface water is less than that of groundwater. Water in the shallow aquifer is slightly con-taminated at shallow depths in the immediate vicinity of the Cross State Solid Waste Disposal Area. The contaminants probably stay near the water table and are filtered out by the sand. (Knapp-USGS) W74-08445

WELL YIELDS IN THE BEDROCK AQUIFERS OF MARYLAND,

Geological Survey, Parkville, Md.

L. J. Nutter.

Maryland Geological Survey Information Circular
16, 1974. 24 p, 5 fig. 3 tab, 18 ref.

Descriptors: *Hydrogeology, *Maryland, *Water yield, Specific capacity. Fractures(Geologic), Data collections, Hydrologic data, Water wells, Water supply, Statistics, Frequency analysis.

Well yields from the bedrock aquifers west of the Fall Line in Maryland are extremely variable and difficult to predict at specific sites because the groundwater is transmitted mainly through a complex and variable fracture system in the rocks. At least 80% of the well records published in Maryland groundwater reports are of domestic and farm wells, which in many cases are located on ridgetops or upland areas where there is little probability of obtaining high-yielding wells. Furthermore, in the construction of domestic wells there is seldom an effort made to obtain the maximum yield. In contrast to domestic wells, municipal and industrial wells are usually drilled for maximum yields, and in many cases only the most productive of several test wells are used for the water supply. Estimates of optimum well yields in generalized groups of bedrock aquifers were made

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using cumulative-frequency graphs of specific capacity based on available well records. On the basis of this analysis, the estimated average yields of wells drilled under optimum conditions for or wens urmed under optimum conditions for generalized groups of bedrock aquifers range from 40 gallons per minute for granite and gneiss to 195 gpm for limestone and dolomite. (Knapp-USGS) W74-08446

GROUNDWATER INVESTIGATIONS IN SIN-

GAPORE, Singapore Public Utilities. Water Planning Unit. Chou Tai Choong.

In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 3-16, 1972. 7 fig, 2 tab.

Descriptors: *Groundwater, *Hydrogeology, *Alluvium, Investigations, Recharge, Aquifer characteristics, Water yield. Identifiers: *Singapore

The groundwater potential in the Older Alluvium covering the eastern part of Singapore is very limited because of poor natural recharge from the ground surface and the unfavorable lithology of the sediments forming the alluvial basin. Small quantities of groundwater for limited private supplies may be abstracted from the thin sand layers. The exact quantity can only be determined from rice exact quantity can only be determined from sustained pumping tests. The cost of abstraction from such low yielding sources will be very expensive and uneconomical. (See also W74-08454) (Knapp-USGS) W74-08455

FEASIBILITY STUDY ON DESALTING BRACKISH WATER FROM THE MT. SIMON AQUIFER IN NORTHEASTERN ILLINOIS.

Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 3A.

WASTE DISPOSAL SYSTEMS FROM A GROUNDWATER HYDROLOGY AND POLLU-TION POINT OF VIEW,

Ministry of the Environment, Ottawa (Ontario). Water Quality Branch.

For primary bibliographic entry see Field 5E. W74-08594

GEOLOGY AND WATER RESOURCES OF THE GIRDWOOD-ALYESKA AREA, ALASKA, Geological Survey, Anchorage, Alaska.

C. Zenone.

Geological Survey open-file report, 1974. 22 p, 5 fig. 5 tab, append.

Descriptors: *Hydrogeology, *Alaska, *Glacial drift, Water pollution, Septic tanks, Alluvial channels, Gravels, Urbanization, Recreation, Skiing. Identifiers: *Girdwood(Alaska).

The unconsolidated sediments which overlie the bedrock of Glacier Creek valley, Alaska, are composed of materials originally transported to the valley by large Pleistocene glaciers. The material has been reworked by glacier ice, melt-water streams, and marine waters. Groundwater supplies streams, and marine waters. Groundwater supplies adequate for single-family dwellings are generally available within 100 feet of the ground surface throughout the valley, except on the steep mountain slopes near the valley margins. The most favorable sites for development of larger-yield, the stable of the stream of the stable of the st public-supply wells are along Glacier Creek in the central part of the valley. Abundant surface water is available from Glacier Creek and its tributaries. The flow regimen of these streams is to some ex-tent regulated by the storage of water in the basin's glaciers and snowfields and the subsequent release of melt water. The inorganic chemical quality of the valley's groundwater and surface water is acceptable for domestic use; suspended sediment in the larger streams may at times preclude their use as potable supplies prior to removal of the glacial silt. Damaging floods have occurred in historic times and are probable in the future. The low flood-plain along Glacier and California Creeks is the most flood prone area. A high-water table and poor infiltration charac-teristics of the clayey and silty deposits in some parts of the valley create conditions unsuitable for septic-tank sewage disposal. Instances of pollution by sewage have already occurred in the Alyeska village area. (Knapp-USGS) W74-08595

WATER FROM THE COASTAL PLAIN AQUIFERS IN THE WASHINGTON, D.C., METROPOLITAN AREA, Geological Survey, Washington, D.C. S. S. Papadopulos, R. R. Bennett, F. K. Mack, and

P. C. Trescott. Circular 697, 1974. 11 p, 7 fig, 20 ref.

Descriptors: *Hydrogeology, *Coastal plains, *District of Columbia, *Water supply, Groundwater, Water yield, Cities, Municipal water.

The Atlantic Coastal Plain aquifers were studied in the vicinity of the Washington, D.C., metropolitan area to estimate the water-supply potential of these aquifers and to determine the possibility of developing an emergency water supply during droughts. The water-supply potential within an as-sumed 30-mile radius of Washington, D.C., is sumed 30-mile radius of Washington, D.C., is about 170 million gallons per day. Aquifers which are now furnishing an estimated 60 million gallons per day could be developed to supply an additional 110 million gallons per day on a continuous basis. This quantity might be even larger if a significant appropriate for the control of the c amount of water is derived from leakage through finer grained confining beds, but further studies would be necessary to determine the amount of leakage and the long-term effects of large-scale leakage and the long-term effects of large-scale continuous use. Furthermore, under intermittent pumping conditions, an assumed emergency supply of 100 million gallons per day could probably be developed from well fields within a 30-mile radius of Washington. (Knapp-USGS)

AN APPRAISAL OF THE GROUNDWATER RESOURCES OF THE UPPER CAPE FEAR RIVER BASIN, NORTH CAROLINA,

Geological Survey, Raleigh, N.C. E. O. Floyd, and R. R. Peace.

North Carolina Office of Water and Air Resources Groundwater, Raleigh, Bulletin No 20, May 1974. 17 p, 5 fig, 4 tab, 5 ref.

Descriptors: Water resources, *Groundwater, *North Carolina, Hydrogeology, Aquifers, Water wells, Hydrologic data, Data collections, Water

pollution sources. Identifiers: *Cape Fear River basin(N.C.).

Large amounts of water are stored in the rocks underlying the upper part of the Cape Fear River basin, North Carolina. Dependable groundwater supplies can be developed from these rocks in all parts of the basin if the hydrologic conditions are properly evaluated and the wells and well fields are designed accordingly. The chemical quality of the groundwater in the basin is generally suitable for most uses. However, excessive concentrations of iron, hardness, and chloride occur in some local areas. (Knapp-USGS) W74-08605

SALT-WATER INTRUSION AND ITS CON-TROL, California Univ., Berkeley, Dept. of Civil En-

gineering.
For primary bibliographic entry see Field 5B.
W74-08662

4C. Effects On Water Of Man'S Non-Water Activities

EROSION CONTROL ON HIGHWAY CON-STRUCTION.

National Academy of Sciences, Washington, D.C. Highway Research Board For primary bibliographic entry see Field 4D. W74-08178

THE CONTROL OF POLLUTION FROM HYDROGRAPHIC MODIFICATIONS. Environmental Protection Agency, Washington, D.C. Office of Air and Water Programs. For primary bibliographic entry see Field 5G.

RUNOFF OF OILS FROM RURAL ROADS TREATED TO SUPPRESS DUST, Edison Water Quality Research Lab., Edison, N.J.

For primary bibliographic entry see Field 5B. W74-08236

ENVIRONMENTAL RESEARCH

HIGHWAYS, For primary bibliographic entry see Field 5B. W74-08251

HYDROLOGICAL EFFECTS OF URBANIZA-

Transactions, American Geophysical Union, Vol. 55, No. 4, p. 190-191, April, 1974.

Descriptors: *Urbanization, *Urban hydrology, Urban sociology, Hydrology, Organizations, Water management(Applied), Water resources development, *Research priorities.

A total of 54 experts from 23 countries par-ticipated in the International Workshop on the Hydrological Effects of Urbanization, in Warsaw Pydrological Effects of Orbanization, in Warsaw, Poland Nov. 8-10, 1973. The workshop completed its set task of reviewing a draft report. The report, which will be published by the time of the End-of-Decade Conference in 1974, describes the effects of urbanization on the hydrological cycle and identified research needs for the next few years. The report is directed primarily at researchers in hydrology, but will have a special summary of in-terest to water managers. (Merritt-FIRL) W74-08257

WATER POLLUTION AND ASSOCIATED EFFECTS FROM STREET SALTING, Environmental Protection Agency, Edison, N.J.

For primary bibliographic entry see Field 5B. W74-08306

OUR GREAT LAKES.

Wisconsin Univ., Madison. Sea Grant College Program. or primary bibliographic entry see Field 2H. W74-08531

TIME OF CONCENTRATION--A KINEMATIC

WAVE APPROACH, Metropolitan Sanitary District of Greater Chicago, Ill, Sewer Design Section. For primary bibliographic entry see Field 2E.

DIGITAL SIMULATION OF THE EFFECTS OF URBANIZATION ON RUNOFF IN THE UPPER SANTA ANA VALLEY, CALIFORNIA, Geological Survey, Menlo Park, Calif.

Identification Of Pollutants—Group 5A

Available from NTIS, Springfield, Va. 22151, as PB-231 303/AS, Price \$3.75 printed copy; \$1.45 microfiche. Water-Resources Investigations 41-73, February 1974. 44 p, 23 fig, 6 tab, 18 ref.

Descriptors: *Urban hydrology, *Simulation analysis, *Urban runoff, *Urbanization, Flood frequency, Storm runoff, Peak discharge, Mathematical models, Rainfall-runoff relationships, Suburban areas, *California. Identifiers: *Santa Ana Valley(Calif), Stanford

Watershed Model.

The Stanford Watershed Model was used to simulate the effects of urbanization on the discharge from five drainage basins in the upper Santa Ana Valley, California, an area with an average annual precipitation of 15 inches. The drainage areas ranged in size from 3.72 to 83.4 square miles. Using the model, synthetic records of streamflow for each watershed were generated to represent various degrees of urban development. Examination of the synthetic records indicated that ur-banization has the following effects on streamflow in the area: (1) average annual runoff from a watershed covered by 10% effective impervious area is approximately 2 inches, and increases by 1 inch for each increase in effective impervious cover equal to 10% of the drainage area; (2) urbanization can increase the magnitude of peak discharge and daily mean discharge with a recurrence interval of 2 years by a factor of three to six; and (3) peak discharges and daily mean discharges that have recurrence intervals greater than a limiting value ranging from 50 to 200 years or more are little affected by urbanization. (Knapp-USGS) W74-08598

HYDROLOGIC EFFECTS OF PATCH CUTTING

OF LODGEPOLE PINE,
National Oceanic and Atmospheric Administration Fort Collins, Colo.

T. L. Dietrich, and J. R. Meiman.

Colorado State University Hydrology Paper No 66, April 1974. 31 p, 21 fig, 28 tab, 32 ref, 2 append. USBR Contract 14-06-6598.

Descriptors: *Water yield improvement, *Clearwatershed management, Cutting management, Watershed management, *Cutting management, Snowpacks, Water management(Applied).

The effects of patch cutting for timber harvest were studied in paired plot studies of soil water snow water equivalent conducted from 1968 to 1973 in lodgepole pine on the Eastern Slope of the Colorado Front Range. Small patch cuts ranging in size from 0.29 acre to 0.61 acre were cut in the fall of 1971. The average increase in water potentially available for streamflow from the cut areas was 11.8 cm. Increase in snow on a relatively small part of the cut areas accounted for 21% of the increase. The remainder of the increase is attributed to reduced evapotranspiration as a result of three removal. Although the results are site-specific and for only the first full hydrologic year after treatment, there does appear to be a very high potential for water yield increase by small patch cuts from sites similar to those studied. (Knapp-USGS)

4D. Watershed Protection

EROSION CONTROL ON HIGHWAY CON-STRUCTION.

National Academy of Sciences, Washington, D.C. Highway Research Board.

Available from Highway Research Board, National Academy of Science, 2101 Constitution Avenue, Washington, D.C. 20418 Price \$4.00. National Cooperative Highway Research Program, Synthesis of Highway Practice 18, 1973. 52 p, 29 fig, 3 tab, 8 ref, 7 append. Descriptors: *Erosion control, *Road construc-tion, *Highways, Mulching, Slopes, Erosion, Scour, Sediment control.

Highway construction specifications include pro-tective measures for land and water. However, erosion and the resulting sedimentation from highway construction continue to be a problem. Construction activities that are subject to high erosion risks include right-of-way clearing, earthwork, ditch construction, haul roads, culvert installation, channel changes, pier or abutment work in streams, temporary stream crossings, borrow pit operation, and hydraulic or mechanical dredging. Factors in addition to exposed area that affect erosion and sediment production are: rainfall intensity, slope, soil type, rate of runoff, and depth and velocity of runoff. Erosion potential must be assessed during the route study and location phases. Soil types, anticipated cuts and em-bankments, grades, proximity to critical areas, and channel change requirements should be studied and costs estimated if special protection is neces-sary. Sediment traps, settling basins, stage seeding and mulching, temporary slope drains, special berms, terraces, ditches and dikes, temporary seeding, sodding, contouring, benching, serrated slopes, and erosion control mesh are placed in the construction contract. Special attention may be directed to the timely paving of ditches, placing of riprap, or other permanent erosion control measures. Rough slopes hold water, seed, and mulch. (Knapp-USGS)
W74-08178

FLOODFLOWS FROM SMALL DRAINAGE AREAS IN OKLAHOMA: PROGRESS REPORT AND DATA COMPILATION,

Geological Survey, Oklahoma City, Okla. For primary bibliographic entry see Field 2E. W74-08292

IMPROVEMENT OF SOIL COVER FOR WATER CONSERVATION, PREVENTION OF SEDIMENTATION AND POLLUTION CONTROL IN THE PHILIPPINES,

National Inst. of Science and Technology, Manila (Philippines). Div. of Agriculture and Natural Resources Research.

For primary bibliographic entry see Field 5G. W74-08481

EROSION CONTROL AND BANK STABILIZA-TION IN METROPOLITAN TORONTO--10 YEAR PROGRAMME AND 5 YEAR PROJECT. Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario). November, 1973, 32 p, 5 tab. W.C.-60.

Descriptors: *Erosion control, *Bank stabiliza-tion, *Water management(Applied), *Classification, Cost sharing, Drainage, Valleys, Watercourses(Legal aspects), Retaining walls, Floodplain, Grading, Land development, Canada

Identifiers: *Toronto(Canada), Stream classification, Stream inventory.

The rapid urbanization of the Metropolitan Toronto area has caused increasing peak load runoffs from storm drainage, causing increasing erosion along the major water arteries. Valley wall slopes have been made unstable by the construction of poorly engineered retaining walls. A study of 6 major streams determined that 17-63% of their lengths required some erosion control and of 1435 valley wall segments 10% showed high scores of instability, while 16% showed high hazard scores. The solutions proposed for the erosion problem are: definition of areas of responsibilities for municipal agencies, naming of an agency to control, monitor, and prepare programs, prevention of further erosion damage, strengthening of legisla-tion to enable positive action, the creation of a central data bank, the development of a long term

program with funds, and the public acquisition of slopes. The ten year programme will include the classification of all streams in the Metropolitan Toronto region. The criteria used for the classification is the significance of the waterway to Metropolitan Toronto and the categories established are: major (Metropolitan Toronto as-sumes cost of remedial action) intermediate (Metropolitan Toronto decides distribution of cost for remedial action) and minor (Boroughs and City of Toronto assume cost). Major and minor remedial works will be performed on both public and private lands, and the owners of private lands will be assessed a part of the cost. Legislation will be proposed to control grading and drainage on new developments. The budget for the 5 year starting project is \$500,000/yr. with 1/2 paid by Metropolitan Toronto and 1/2 by the Province of Ontario. (LaPointe-North Carolina) W74-08488

A BILL TO AMEND THE SOIL CONSERVA-TION AND DOMESTIC ALLOTMENT ACT. For primary bibliographic entry see Field 6E. W74-08554

5. WATER QUALITY MANAGEMENT AND PROTECTION

GROUND WATER POLLUTION FROM SUB-SURFACE EXCAVATIONS.
Environmental Protection Agency, Washington,

D.C. Office of Air and Water Program.
Available from Sup Doc, GPO, Washington, D.C. 20402 price 52.25. Report EPA-430/9-73-012, 1973.
217 p, 9 fig, 21 tab, 125 ref, append.

Descriptors: *Water pollution sources, *Path of pollutants, *Groundwater, Waste water disposal, Malenclaves, Waste disposal wells, Septic tanks, Cesspools, Pit recharge, Excavation, Water pollution control Identifiers: Federal water pollution control act.

Every hole in the ground, whether natural or manmade, is a potential source of groundwater con-tamination. There are three basic mechanisms by which groundwater becomes polluted: The natural filtering system of vegetation, soil, silt, sand, gravel and rocks that protects groundwater is bypassed by polluting substances beyond its capacity to handle them, or by substances that are unfilterable; and the hydraulic or chemical balance in the subsurface is altered so that polluting substances move to, within, or between aquifers. The use of subsurface excavations for the disposal of wastes is growing, the types of materials so disposed of are legion, and the placement and isolation of these materials so as to avoid adverse environmental impacts (particularly groundwater quality degradation) is a difficult and complicated problem. The states, in order to avoid the longterm pollution of huge quantities of usable water, must continue to devote careful and expert atten-tion to the protection of the subsurface environment to assure their citizens of a continuing supply of good quality groundwater. (Knapp-USGS)

5A. Identification Of Pollutants

A BIBLIOGRAPHY ON THE POLLUTION ASPECTS OF COKE OVENS,

British Steel Corp., (Sheffield) (England). Strip Mills Div.

For primary bibliographic entry see Field 5B. W74-08183

AUTOMATED METHOD FOR ORTHO-ORTHO-PLUS HYDROLYZABLE AND TOTAL

Group 5A-Identification Of Pollutants

PHOSPHATE IN SURFACE AND WASTE-

WATERS, Proctor and Gamble Co., Cincinnati, Ohio. Ivorydale Technical Center. Q. W. Osburn, D. E. Lemmel, and R. L. Downey. Environmental Science and Technology, Vol 8, No 4, p 363-366, April, 1974. 2 fig, 5 tab, 7 ref.

Descriptors: *Phosphates. *Measurement. *Colorimetry, *Automation, Methodology, Tur-bidity, Neutralization, Surface waters, Waste bidity, Neutralization, Surface waters, water(Pollution), *Pollutant identification. Identifiers: Orthophosphates.

All the titled classifications of phosphates are concurrently measured colorimetrically as orthophosphate using appropriate modifications of the Murphy and Riley reagent. Features of the method include a means of compensating for the high bias effect of turbidity on orthophosphate results and elimination of a need for neutralization of the acidic sample streams of the hydrolyzable and total phosphate determinations prior to color development. (Sandoski-FIRL) W74-08208

MEASUREMENT AND MONITORING UNITS FOR WASTE WATER (MESS-UND UEBERW-WACHUNGSGERAETE FUER ABWASSER), C. G. Enke.

Wasser, Luft and Betrieb, Vol 18, No 1, p 20-25, 1974. 12 fig, 1 ref.

Descriptors: *Measurement, *Monitoring, *Instrumentation, Equipment, *Waste water treat-Descriptors: *Monitoring, ment, Hydrogen ion concentration, Treatment facilities, Oxygen requirements, Turbidity, Conductivity, Chemical oxygen demand, *Pollutant identification.

Measurement and monitoring units for wastewater include pH measuring instruments which check the pH of the cleaned water leaving purification plants. Rake cleaning facilities are used for better operation of the purification plants and pumping stations with new automatic devices that remove the material from the rakes in the opposite direction to the water flow. Oxygen measurement mains and battery-operated oxygen analyzers are available whose measurement ranges between 0 and 30 mg O2/liter and are stabilized against the ambient temperature. A COD measuring unit involving the use of bichromate oxidation is illustrated, with the consumed quantity of bichromate being the measurement for the COD value. Descriptions of electric CO2 meters and conductivity analyzers are included. (Sandoski-FIRL) W74-08219

THE COUNTING OF AEROBIC ACTINO-MYCETES IN WATER SAMPLES MYCETES IN WATER SAMPLES (DENOMBREMENT DES ACTINOMYCETES AEROBIES DE L'EAU), Institut Pasteur, Lille (France). Laboratoire

d'Hydrobiologie.
C. Eak-Hour, and H. Leclerc.
Annales de Microbiologie (Institut Pasteur), Vol
124, Part B, No 4, p 533-546, 1973. 3 tab, 22 ref.

Descriptors: *Methodology, *Water sampling, Soil analysis, Antibiotics(Pesticides), Bacteria, Fungi, Efficiencies, *Water treatment, Water purification, Sediments.
Identifiers: *Antinomycetes, Samples treatment.

A practical method for the quantification of actinomycetes in water and in sediments is described. Factors investigated include: suppression of bacteria and of fungi by the use of antibiotics; the purification, concentration, and homogenization of samples; and, the comparative efficiency of different culture media. Techniques for different types of water samples are suggested. (Sandoski-FIRL) W74-08220

OF TOXICITY BIOASSAY USING PROTOZOA IN THE STUDY OF AQUATIC EN-VIRONMENT POLLUTION AND ITS PREVEN-

Institutul de Medicina si Farmacia, Iasi (Rumania). Catedra de Igiena.

S. Apostol.

Environmental Research, Vol 6, No 4, p 365-372, 1973. 4 fig, 2 tab, 17 ref.

Descriptors: *Toxicity, *Bioassay, Evaluation, *Protozoa, Laboratory tests, Bioindicators, Water pollution effects, *Pollutant identification.

Identifiers: *Paramecium.

Methods are described for short-term (acute) and long-term (chronic) toxicity evaluation in order to determine the degree of toxicity of various waterborne contaminants and to establish the tolerance to these agents. The technique consists in exposure of cultures of Paramecium caudatum Ehr. in serial dilution tests for short and extended time intervals. Results may be obtained within a few hours in the acute and within two weeks in the chronic tests. (Sandoski-FIRL) W74-08221

SUSPENDED SOLIDS ANALYSIS USING ERTS-

Pennsylvania Univ., Philadelphia. Moore School of Electrical Engineering.
For primary bibliographic entry see Field 2J. W74-08301

A SIMPLE DIGESTION PROCEDURE FOR ESTIMATION OF TOTAL NITROGEN IN SOILS AND SEDIMENTS.

Purdue Univ., Lafayette, Ind. Dept. of Agronomy. For primary bibliographic entry see Field 5B. W74-08324

THE ACCUMULATION OF ORGANIC AND IN-ORGANIC MERCURY COMPOUNDS BY THE EASTERN OYSTER (CRASSOSTREA VIR-GINICA).

Environmental Protection Agency, Dauphin Island, Ala. Gulf Coast Water Supply Research, Lab

For primary bibliographic entry see Field 5C. W74-08346

THE USE OF THE DILUTION WATER EFFECT AS A WATER QUALITY CRITERION, Southeastern Massachusetts Univ., North Dart-

mouth. Dept. of Biology. I. L. Cox.

Bulletin of Environmental Contamination and Toxicology, Vol 11, No 3, p 256-257, March 1974. 1 fig. 2 ref

Descriptors: *Toxins, Aquatic life, *Water quality, *Analytical techniques, Water sources, Dilution, Toxicity, Water pollution effects, Pollutant

identification. Identifiers: *Dilution water.

A principal difficulty in the toxicology of marine organisms has been obtaining dilution water that is free from substances which may affect the response of a test organism to a toxin. The possibility of synergism between unknown chemical constituents in the dilution water and controlled additions of a toxin suggests and entirely different approach to assessing water quality. The doseresponse relationship for a particular toxine or pollutant is compared using relatively clean water as a control dilution water source and water suspected of being polluted as the test dilution water source. Experimental procedures are detailed. (Sandoski-W74-08356

WATER QUALITY MONITORING PERIENCE IN THE SOMERSET I AUTHORITY AREA, 1968-1972, B. J. Elvins.

Water Pollution Control, Vol 78, No 1. p 33-40, 1974. 4 fig.

Descriptors: *Dissolved oxygen, *Temperature, *Monitoring, *Instrumentation, Gaging stations, Data collections, Flow measurement, Water quality, *Pollutant identification.
Identifiers: *United Kingdom(Somerset River).

The Somerset River Authority has concentrated its resources on obtaining continuous information for dissolved oxygen and temperature parameters, supplemented by the use of automatic samplers to give information on other chemical factors. The stations are simple and battery-operated, requiring regular maintenance with the probes being immersed directly in the river. System difficulties are maintaining sufficient flow around the probe when the water is penned and the formation of algal and Sphaerotilus growths on the probe, which prevent accurate readings. The chief problem that occurs in the collection of data from quality stations is the presentation of the information in a form which can be easily related to other factors in the river. The two forms of monitoring described when combined with flow measurement and with regular semi-quantitative biological sampling of rivers, can give most useful information. (Sandoski-FIRL) W74-08360

A PROGRAMMED SAMPLER FOR RUNOFF AND BEDLOADS,

Agricultural Research Service, Lincoln, Neb. N. P. Swanson.

Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 4, p 790-792, July-August, 1973. 5 fig, 5 ref.

Descriptors: *Feed lots, *Runoff, *Bed load, *Nebraska, Chemical analysis, Rain gauge, Hydrograph analysis, *Sampling, *Pollutant identification. Farm wastes. Identifiers: Feedlot research, Quantitative analy-

A programmed, automatic sampler that collects a sequence of composite samples of runoff and accompanying bedloads has been in use on a feedlot research installation near Lincoln, Nebraska, for over four years. The sampler consists of an arm and dipper electrically driven by a gear reduction motor through sprockets and a chain, a tipping bucket that collects the samplings from several rotations of the dipper and delivers them as a sin-gle sample, a turntable holding successive sample containers, a gear reduction motor moving the turntable by a friction drive, and a program timer. Composited samples are collected over five minute sampling periods with volumes of about three liters. The sampler can be programmed to obtain individual samples for any of the 144 fiveminute periods during 12 total hours of actual operation. The runoff need not be continuous. The ime of collection of each sample is recorded to relate to the runoff hydrograph and recording rain gage chart. Bedload particles up to 5/8 inch in diameter can enter the rotating sampler dipper which passes under the discharge. The sampler permits both qualitative and quantitative analyses of runoff with relation to time for an event. Maintenance and field servicing requirements have been minimal. (Merritt-FIRL) W74-08361

ELECTROANALYTICAL STUDIES METHYLMERCURY IN AQUEOUS SOLUTION, Hercules Research Center, Wilmington, Del. R. E. Heaton, and H. A. Laitinen. Analytical Chemistry, Vol 46, No 4, p 547-553, April 1974. 6 fig, 31 ref.

Identification Of Pollutants—Group 5A

Descriptors: *Electrochemistry, *Polarographic analysis, Analytical techniques, Methane, Mercu-ry, Volumetric analysis, Pollutant identification, Aqueous solutions.

*Methylmercury, Electroanalytical

The electrochemical reduction of monomethylmercury compounds in solution has been studied using pulse polarography, cyclic voltammetry, and related techniques. Reduction of these compounds at a mercury electrode occurs in two one-electron steps. The first results in the formation of a methylmercuric radical on the electrode. This step is reversible under polarographic conditions, but the polarographic wave is distorted due to involve-ment of the methylmercuric radical in subsequent chemical reactions. Addition of the second electron results in reduction of the methylmercuric compound to elemental mercury and methane, giv-ing rise to the second polarographic wave. This reduction is irreversible; the wave is distorted. The first pulse polarographic wave has analytical utility arising from a linear peak current vs. concentration curve between concentrations of .0000001 and .0001 M. The analytical implications of the reduction mechanism are discussed; attention is given to effects of coordinating agents and to detection limits. (Prague-FIRL) W74-08362

AQUATIC ORGANISMS FROM SELECTED SITES ALONG THE PROPOSED TRANS-ALASKA PIPELINE CORRIDOR, SEPTEMBER 1970 TO SEPTEMBER 1972,

Geological Survey, Anchorage, Alaska. For primary bibliographic entry see Field 2I. W74-08369

DETERMINATION OF THE ALKALINITY OF MILL EFFLUENTS (OPREDELENIE SHCHELOCHNOSTI STOCHNYKH VOD), Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi

Promyshlennost (USSR). I. G. Alesina, M. M. Krunchak, I. V. Zhukova, and

Nov 1973. 1 fig, 1 tab.

Descriptors: *Pulp wastes, Analytical techniques, *Alkalinity, *Waste water(Pollution), *Water analysis, *Conductivity, Volumetric analysis, Effluents, Pulp and paper industry, *Pollutant identification

Identifiers: Black liquors, Kraft mills.

In determining the alkalinity of pulp and paper mill effluents, such as black liquors from kraft digestions, the standard titration with an indicator or by potentiometry gives inaccurate results, because of the high buffering power of such effluents. Conductometric titration is proposed as being a more sensitive method and shown to offer advantages over conventional titrations in analyses of dilute black liquors and biologically purified black liquors. (Stapinski-IPC) W74-08411

SIMPLE APPARATUS FOR ON-SITE CONTINU-OUS LIQUID-LIQUID EXTRACTION OF OR-GANIC COMPOUNDS FROM NATURAL WATERS.

Gotenburg Univ. (Sweden). Dept. of Analytical Chemistry M. Ahnoff, and B. Josefsson.

Analytical Chemistry, Vol 46, No 6, p 658-663, May 1974. 4 fig, 5 tab, 26 ref.

Descriptors: *Chlorinated hydrocarbon pesticides. Pesticides, *Aldrin, *Dieldrin, *DDT, Water analysis, *Pollutant identification, *Polychlorinated ysis, "Pollutant identification, "Polychlonnated biphenyls, Analytical techniques, Laboratory tests, On-Site tests, Gas chromatography, "Separation techniques, Solvent extractions. Identifiers: Lindane, Trace analysis, Gota River, Benzene hexachloride(Hexachlorocyclohexane).

A description and schematic diagram are given of an apparatus for the continuous extraction of trace organic substances (such as pesticides) from natural waters. The apparatus consists of an extraction unit, magnetic stirring device, and pump. Hexane and cyclohexane are suitable extracting agents. The theory for extracting chlorinated hydrocarbon pesticides continuously from water with a stationary immiscible solvent is discussed. In laboratory tests, the recovery of added chlorinated pesti-cides (e.g., lindane, dieldrin, aldrin, DDT) was 83-96%. Gas-liquid chromatography of extracts of water from the Gota River (Sweden) permitted determination of polychlorinated biphenyls in the concentration range of 0.1-1.0 ng/liter. (Buchanan-W74-08414

OUANTITATIVE MEASUREMENTS OF INOR-GANIC MERCURY AND ORGANOMERCURI-ALS IN WATER AND BIOLOGICAL MEDIA BY GAS-LIQUID CHROMATOGRAPHY

North Carolina Univ., Chapel Hill. Dept. of Pathology.

Patiology.
P. Zarnegar, and P. Mushak.
Analytica Chimica Acta, Vol 69, No 2, p 389-407,
April 1974. 8 fig, 2 tab, 18 ref.

Descriptors: *Water analysis, *Mercury, *Chromatography, *Gas chromatography, *Analytical techniques, Inorganic compounds, *Pollutant identification.

Gas-liquid chromatography is used to determine inorganic Hg in the presence or absence of organic Hg compounds in water, blood, and other biological media after alkylation or arylation. Best results for inorganic Hg were realized with penta-cyanomethylcobaltate(II) and tetraphenylcyanomethylcobaltate(II) and tetraphenyl-borate(III) via the generated methyl and phenyl mercurial. Tetraethyltin, forming ethylmercury, was less satisfactory. Lower detection limits with these reagents were in the range of 10-30 ng of Hg/ml of medium. Codetermination of inorganic Hg and various organomercurials was conducted by sequential or simultaneous procedures with several column temperatures and packings. Optimal chromatographic results were achieved with Durapak Carbowax 400 (low K') on Porasil F and 10% DEGS on Anakrom SD. (Brown-IPC) W74-08415

DETERMINATION OF NITRATE IN WATER WITH A NEW CONSTRUCTION OF ION-SELECTIVE ELECTRODE,

Warsaw Univ. (Poland). Inst. of Fundamental

Problems in Chemistry.

A. Hulanicki, R. Lewandowski, and M. Maj Analytica Chimica Acta, Vol 69, No 2, p 409-414, April 1974. 3 fig, 2 tab, 6 ref.

*Water analysis, *Nitrates, alysis, *Analytical techniques, *Nitrates. Descriptors: *Chemical analysis, *Analytical techniques, *Electrodes, *Pollutant identification, Fresh-

A new design of the liquid-state electrode for nitrate ions is proposed. It contains a porous wick saturated with the liquid ion-exchanger, and has no internal reference solution. The electrode was used to determine nitrate in tap water at the 8-10 ppm level. The effects of chloride and bicarbonate ions are eliminated by addition of silver sulfate and a phosphate buffer, which also maintains constant ionic strength. The precision of a series of measurements is better than 2%, but the results differ by up to 10% from data obtained by the colorimetric brucine procedure. (Brown-IPC) W74-08420

DETERMINATION OF TOTAL HYDROCAR-BONS IN SEA WATER AT THE MICROGRAM LEVEL WITH A FLOW CALORIMETER, Kiel Univ. (West Germany). Institut fuer Meereskunde.

Journal of Chromatography, Vol 90, No 1, p 79-85, March 13, 1974. 4 fig, 1 tab, 14 ref.

Descriptors: *Water analysis, *Chromatography, *Hydrocarbons, *Sea water, Analytical techniques, Separation techniques, Equipment, Instrumentation, *Pollutant identification.

One liter of water is extracted with 10 ml of 1.2.2trichlorotrifluoroethane. The extract is concentrated to 100 microliter. A 50-microliter volume is injected into a high-performance liquid chromato-graphic system with a flow calorimeter that measures the absorbance of hydrocarbons on porous glass beads. A short silica gel column in the system removes non-hydrocarbon material. A chromatogram is obtained within 3 min, and only one peak has to be evaluated. The minimum detectable amount is 4.0 plus or minus 3.4 microgram/liter. These values can be improved by extracting larger volumes. The equipment used is fairly inexpensive and can readily be taken to sea. (Brown-IPC)

GAS-CHROMATOGRAPHIC MINATION OF SOME LIGNIN COMPOUNDS IN SURFACE WATERS (DIE GASCHRO-MATOGRAPHISCHE BESTIMMUNG EINIGER LIGNINVERBINDUNGEN IN OBERFLAECHEN-

GEWAESSERN),
Polish Academy of Sciences, Zabrze. Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego.

J. Paluch, and S. Stangret.

Fortschritte in Wasserchemie and Grenzgebiete, No 14, p 89-100, 1972. 4 fig, 2 tab, 38 ref. English

Descriptors: *Pollutant identification, Water pollution sources, Water analysis, *Lignins, *Sulfonates, Analytical techniques, *Pulp wastes, *Sulfite liquors, Hydrolysis, Sampling, Surface waters, Waste water(Pollution), Monitoring, Chromatography, *Gas chromatography.
Identifiers: Vanillin, Folin-Denis reagent.

The vanillin method for estimation of lignosulfonic acids (LSA) in water involves alkaline hydrolysis of the sample followed by extraction of vanillin with ether and quantitative determination by gas chromatography. Using a spent sulfite pulping liquor of known composition to calibrate the method, LSA determinations were made in river water sampled above and below a pulp and paper mill site. The lignin concentrations found were 20-30% lower than those determined using the Folin-Denis method. (Speckhard-IPC) W74-08433

PHOSPHORUS IN WASTE WATER.

Scandinavian Pulp, Paper and Board Testing Committee, Stockholm (Sweden). Norsk Skogindustri, Vol 27, No 11, p 322-323, Nov. 1973. Scan-W8:73.

Descriptors: Water analysis, *Chemical analysis, *Analytical techniques, Waste water(Pollution), *Phosphorus *Phosphorus compounds, *Phosphates, *Colorimetry, Spectrophotometry, Standards, Europe, Industrial wastes, Oxidation, *Water quality standards. Identifiers: Scandinavia.

In this Scandinavian standard test method, samples of waste waters to be analyzed for phosphorus content are subjected first to wet combustion (oxidation) with hydrogen peroxide plus concentrated sulfuric acid to convert all P com-pounds into orthophosphates. The subsequent addition of molybdic acid produces a yellow complex which is reduced to a blue complex by ascorbic acid. The blue complex is then determined colorimetically. (Brown-IPC) W74-08438

Group 5A-Identification Of Pollutants

AUTOMATIC WASTE SLUDGE SAMPLER. Hampton Township Water Pollution Control Plant, Allison Park, Pa.

A. Bologna Deeds and Data (Water Pollution Control Federation), April 1974, p D4-D5. 2 fig.

Descriptors: *Sampling, Sludge, *Waste water treatment, *Sewage treatment, *Automatic control, Equipment, Treatment facilities, *Municipal wastes, *Sludge treatment, Moisture content,

Odor and solids buildup problems at a municipal waste water treatment plant indicated the need for an automatic sampler to take 24-hr composite samples for determinations of waste sludge solids content. An appropriate device has been developed which utilizes the existing flow to operate without an external power source. The inexpensive and relatively simple sampler is described and illustrated. (Brown-IPC) W74-08442

TEST AND EVALUATION OF OIL POLLUTION ABATEMENT DEVICES FOR SHIPBOARD USE, PHASE 1.

Coast Guard, Washington, D.C. Naval Engineering Div.

For primary bibliographic entry see Field 5G. W74-08450

ANALYSES OF TARS, CHARS, GASES, AND WATER FOUND IN EFFLUENTS FROM THE SYNTHANE PROCESS,

Bureau of Mines, Pittsburgh, Pa. Pittsburgh Energy Research Center.

A. J. Forney, W. P. Haynes, S. J. Gasior, G. E. Johnson, and J. P. Strakey, Jr.

Bureau of Mines Technical Progress Report 76, January 1974. 9 p, 2 fig, 7 tab, 4 ref.

Descriptors: *Industrial wastes, *Coals, *Waste water treatment, Water pollution sources, Fuels, Chemical wastes, Gases, *Pollutant identification. Identifiers: *Coal gasification, *Synthane process.

Extensive studies were made of the various effluents found in the Synthane coal-to-gas process. Analyses were made of the waters, gases, and trace elements present in some of the streams. The major effluent problem is the contaminated con-densate from the gasifier. The contaminated con-densate from the shift converter would be similar to but more dilute than the gasifier condensate. A satisfactory means of solving the effluent problems of the Synthane plant is commercially available. (Knapp-USGS) W74-08592

QUALITY OF SURFACE WATER IN THE VICINITY OF OIL EXPLORATION SITES, BIG CYPRESS AREA, SOUTH FLORIDA, Geological Survey, Tallahassee, Fla.

E. T. Wimberly

Geological Survey open-file report 74012, 1974. 26 p, I fig, I ref.

Descriptors: *Water pollution sources, *Oil fields, *Brines, Salinity, Saline water, Oil pollution, Data collections, data, Sampling, Water quality, *Florida, Chlorides, Hydrologic data, Sar *Pollutant identification. Identifiers: Big Cypress(Fla).

Exploration for oil in the Big Cypress area of south Florida caused concern that this activity might change the quality of surface water in the vicinity of the drilling sites. Samples of surface water were collected near the proposed explora-tion sites before oil drilling activities commenced in order to assemble background water-quality data. After the drilling sites were actually in use the surface water was again sampled to determine whether the exploration activities had caused any

water-quality changes. At Site 4, concentration of June 1973 was about 445 times higher than that of August 1971; at site 5, concentration of June 1973 was about 15 times higher than that of August 1971 and July 1972; at site 8, concentration of June 1973 was about 8 times higher than that of August 1971. The October 1973 sampling showed that chloride concentrations at all sites were at background level. (Knapp-USGS) W74-08596

RADIOLOGICAL SURVEY OF NEW LONDON HARBOR, THAMES RIVER, CONN., AND EN-VIRONS.

Office of Radiation Programs, Washington, D.C. For primary bibliographic entry see Field 5B.

ENVIRONMENTAL RADIOACTIVITY IN IL-LINOIS, 1970.

Office of Radiation Programs, Washington, D.C. Field Operations Div. or primary bibliographic entry see Field 5B. W74-08646

STATE ENVIRONMENTAL RADIOACTIVITY SURVEILLANCE PROGRAMS, 1972,
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5B. W74-08647

SUMMARY OF ENVIRONMENTAL MONITOR-ING AT PHILADELPHIA, 1958-1971,
Philadelphia Public Health Dept., Pa. Div. of Occupational and Radiological Health.

For primary bibliographic entry see Field 5B. W74-08648

TRITIUM BURDENS IN TWO ARCTIC VIL-National Environmental Research Center, Las

For primary bibliographic entry see Field 5B. W74-08649

TRITIUM SURVEILLANCE SYSTEM, OCTOBER-DECEMBER 1972.

Office of Radiation Programs, Las Vegas, Nev. For primary bibliographic entry see Field 5B. W74-08650

SURVEILLANCE PROGRAMS, WATER NOVEMBER 1972.

National Environmental Research Center, Las For primary bibliographic entry see Field 5B. W74-08651

WATER SURVEILLANCE PIFEBRUARY 1973 AND 1972, PROGRAMS. ANAL VSES

National Environmental Research Center, Las Vegas, Nev. For primary bibliographic entry see Field 5B. W74-08652

RADIOACTIVITY IN WASHINGTON SURFACE WATER JULY 1970-JUNE 1971. Washington State Dept. of Social and Health Ser-

vices, Olympia. For primary bibliographic entry see Field 5B. W74-08653

RADIOACTIVITY IN NEW YORK STATE SUR-FACE WATER, JULY-DECEMBER 1971.

New York State Dept. of Environmental Conservation, Albany. Bureau of Radiological Pollution Control.

For primary bibliographic entry see Field 5B.

W74-08654

WATER SURVEILLANCE PROGRAMS, APRIL-MAY 1973.

National Environmental Research Center, Las Vegas, Nev

For primary bibliographic entry see Field 5B. W74-08655

TRITIUM SURVEILLANCE SYSTEM, APRIL-

National Environmental Research Center, Las Vegas, Nev.

For primary bibliographic entry see Field 5B. W74-08656

POTENTIOSTATIC COULOMETRIC DETER-MINATION OF VANADIUM, VANADIUM-MAN-GANESE AND VANADIUM-IRON MIXTURES AND THE INFLUENCE OF CHROMIUM ON THE PROCESS, Exeter Univ., (England). Dept. of Chemistry.

E. Bishop, and P. H. Hitchcock. Analyst, Vol 98, No 1169, p 572-579, August 1973. 3 fig, 2 tab, 14 ref.

Descriptors: *Pollutant identification, Manganese, Iron, Chromium, Chemical analysis, Electrodes, Electrolytes, *Analytical techniques.

Identifiers: *Vanadium, *Voltammetry, Chemical

interference, Coulometry,

A simple coulometric cell was constricted and a commercial potentiostat was adapted for use in determining V, V-Mn, and V-Fe in various media. Since current integration by strip-chart recorder was inadequate, an RC integration system was constructed from polystyrene capacitors. Pretreatments of electrolytes and electrodes are described. Vanadium (V) was determined at minus 0.128 V in acetate buffer and at plus 0.247 V in 2.0 M sulphuric acid, in the latter with a relative standard deviation of 0.27 percent and a 95 percent confidence level result of 0.1008 to 0.1011 M compared with 0.1012 M for a standard solution. Chromium (VI) suppressed all reduction at pH 4.0, and reduced simultaneously with vanadium in sulphuric acid. Manganese (VII) reduced to manganese (III) in the first step at plus 0.7 at pH 3.5 and manganese (III) and vanadium (V) simultaneously reduced in second step at minus 0.12 V. The separation of iron (III) was possible at plus 0.9 V but inpracticable; simultaneous reduction at plus 0.25 V in 2.0 M sulphuric acid followed by re-oxidation of the iron (II) at plus 1.0 V is recommended. (Little-Battelle) W74-08674

BIOLOGICAL METHODS FOR THE ASSESSMENT OF WATER QUALITY. A SYMPOSIUM PRESENTED AT THE SEVENTY-FIFTH ANNUAL MEETING, JUNE 26-29, 1972.

American Society for Testing and Materials, Philadelphia, Pa.

Trinacetonia, 71 a 25, 1972. p 1-3, 6, 31, 46, 61, 76, 96, 117, 127, 148, 164, 178, 194, 209, 221, 227, 242, \$16.25.

Descriptors: *Bioassay, *Pollutant identification, *Bioindicators, *Methodology, Laboratory tests, *Water quality, *Assessments, On-site tests, Water pollution, Aquatic life, Data storage and retrieval, Biological communities, Reviews, Aquatic microorganisms, Benthic fauna, Toxicity, Water pollution effects, Environmental sanitation, Instrumentation, Benthic flora, Water manage-ment(Applied), Mixing, Mixolimnion, Monitoring. Identifiers: Biological monitoring, Species diversi-ty index, Continuous flow techniques, Macroinvertebrates, Sample preservation, Microbiological inhibition test.

This volume is intended to be a management tool to apprise the reader of the types of considerations involved in making biological assessments of

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water quality, developing water pollution monitor-ing programs, and assessing the effects of poten-tially deleterious waste discharges in the aquatic environment. Also, it provides information which would enable a nonbiologist to get a state-of-theart view of the existing techniques available, as well as some historic perspective. Papers by world authorities on the use of fish, algae, aquatic invertebrates, and bacteria in the assessment of pollution, in addition to bioassays for evaluating the toxicity of products or waste effluents, are included. Futuristic methods for continuous biological monitoring of industrial effluents are presented, as well as a possible alternative to the much belabored biochemical oxygen demand. (Holoman-Battelle) W74-08675

THE BRACKISH WATER CLAM RANGIA CU-NEATA AS INDICATOR OF ECOLOGICAL EF-FECTS OF SALINITY CHANGES IN COASTAL

Texas A and M Univ., College Station. Dept. of

For primary bibliographic entry see Field 5C. W74-08676

RESEARCH TO DETERMINE THE ENVIRON-MENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES.

Skidway Inst. of Oceanography, Savannah, Ga. For primary bibliographic entry see Field 5C.

AIR-BORNE ACID, Swedish Water and Air Pollution Research Lab., Goteborg.

C. Brosset

Ambio. Vol 2, No 1/2, p 2-9, 1973. Illus. Identifiers: Human health, tion(Atmospheric), *Sulfur dioxide, *Air pollution, *Acids(Air borne).

Studies concerning acidification in Sweden led to the development of a method of determining strong acid in precipitation and a technique with which contributions to the acid deposition from local as well as from distant emission sources can be determined. The results of the studies presented a new aspect of the effects of SO2 and particle emissions. The effect on human health that is today tentatively ascribed to the combined impact of SO2 and particles is, instead, attributable to particle-borne acid. If this is the case, measurements of particle-borne acid should replace or complement the measurements of SO2.—Copyright 1973, Biological Abstracts, Inc.

RESIDENCE TIME OF SULFUROUS AIR POL-LUTANTS FROM A LOCAL SOURCE DURING PRECIPITATION,

Uppsala Univ. (Sweden). Dept. of Meteorology. U. Hogstrom.

O. Hogstrom. Ambio. Vol 2, No 1/2, p 37-41, 1973. Identifiers: *Air pollution, Pollutants, Precipita-tion(Atmospheric), *Rainfall, Snow, *Sulfurous air pollution, Fallout.

The wet fallout pattern of sulfate and strong acid around a locally restricted source area was studied on 5 different occasions, during well-defined rainfalls and snowfalls, in order to get an estimate of the residence time of sulfurous air pollution released during rainfall or snowfall. In each case samples were obtained from about 100 points situated on concentric 180 deg arcs with a maximum radius of 60 km. The 5 tests indicate that 2/3 of the S that is released during rainfall or snowfall is deposited within a distance of 50-100 km from the source.—Copyright 1973, Biological Abstracts, W74-08690

DETECTION AND QUANTITATIVE DETERMINATION OF SALMONELLAE IN SURFACE WATERS AND IN THE WATER OF A MUNICIPAL WATER SUPPLY SYSTEM, (IN RUS-SIAN), G. P. Kalina

G. F. Kanna. Gig Sanit. Vol 37, No 6, p 77-80, 1972. Identifiers: Epidemiology, Human infections, *Municipal water, *Salmonellae, Surface waters, *Water supply, Solid wastes, *Pollutant identifica-

A survey was made of the literature to determine the possibility of Salmonella contamination occurring in water. The possibility of this occurring exists since human waste provides a breeding ground for these organisms. The role of water in the epidemiology of Salmonella infection is supported. epidemiology of Salmoneila infection is supported.

Various methods of detection and quantitative determination of Salmonella in water are discussed.--Copyright 1973, Biological Abstracts, Inc. W74-08693

DETERMINATION OF THE ACTIVITY OF NITRIFYING BACTERIA IN SURFACE WATERS BY A MODIFIED BOD-TEST, (IN GERMAN).

Hamburgisches Hygienisches Institut (West Ger-

For primary bibliographic entry see Field 5B.

THE SHARE TAKEN BY NITRIFICATION PROCESSES IN THE BIOCHEMICAL OXYGEN DEMAND (BOD) IN THE WATER OF THE RIVER ELBE, (IN GERMAN), Hamburgisches Hygienisches Institut (West Ger-

many).

K. Roch, and A. Kaffka. Zentralbi Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. Vol 155, No 2, p 189-202, 1971. Illus. English summary. Identifiers: Bacteria, *Biochemical oxygen de-mand, Effluents, *Nitrification, Rivers, Waste water, *West Germany(Elbe River).

In addition to the standard 5-day BOD (biochemical O2 demand) test a modified method was applied to eliminate nitrification. Complete suppression of nitrification was obtained by admixture of 0.1 mole/liter ammonia nitrogen (5.35 g/1 NH4C1) to the sample pH 7.0 or slightly below. Differences in the O2 demand between the 2 methods represented the demand due to nitrifica-tion. In 1969 studies of the Elbe stream indicated that the percentage part of nitrification in BOD can rise to 81.5%. The waste effluents discharged into the stream by the main sewage treatment plant of Hamburg, West Germany, raise the O2 demand of the nitrifying organisms downstream. The rate of nitrification depended on the seasonal temperature fluctuations in the stream, the content of ammonia and the number and activity of the nitrifying bacteria. Because of the differences in the conditions in the surface waters and during the laboratory tests (constant incubation temperature, dark-ness during and aeration before incubation) the BOD test did not indicate the real proceedings in the waters. A high carbonaceous BOD could be stimulated by active nitrification. The standard BOD could result in misinterpretation of the degree of self-purification of the water of a stream. For that reason using a modified method in addition to the standard BOD to eliminate nitrification during incubation time was recommended.--Copyright 1973, Biological Abstract, Inc. W74-08695

5B. Sources Of Pollution

OPTIMIZATION OF THE ASSIMILATIVE WASTE CAPACITY OF THE UNSATURATED

AND SATURATED ZONES OF AN UNCON-

FINED AQUIFER SYSTEM, Univ., of California, Los Angeles. School of Engineering and Applied Science. R. Willis.

Available from the National Technical Informa-tion Service as PB-232 428; \$5.00 in paper copy, \$1.45 in microfiche. Report UCLA-ENG-7394, December 1973. 153 p, 8 fig, 11 tab, 90 ref. OWRR B-150-CAL(11)

Descriptors: *Aquifer, *Waste assimilative capacity, *Mathematical models, *California, *Optimization, Zone of saturation, Dilution, Cost *Sewage treatment, Model studies, Treatment facilities

Identifiers: Whittier Narrows(Calif), Santee Water Reclamation Project(Calif), Mass transport theory. Flow equations.

A mathematical model to optimize the assimilative waste capacity of unconfined aquifers is formulated. The aquifer is to be used conjunctively with surface sources as a source of water supply. Waste waters may be introduced into the ground water aquifer system by either well injection or by basin spreading of waste waters. In the model, three treatment processes are available to reduce constituent concentrations present in the waste waters: (1) dilution, (2) surface treatment of each constituent, and (3) the assimilative capacity of the unsaturated and saturated zones of the aquifer system. The total cost for supplying the dilution water and the cost for surface treatment of each constituent is minimized by the model. Constraints on water quality are maintained throughout the aquifer system. The model is a mixed integer pro-gramming problem which is decomposed into subproblems for each set of feasible unit processes. Each subproblem involves minimization of a concave function over a convex constraint set. The solution procedure examines the extreme points of the convex set to determine the minimum cost solution. The subproblem solutions are compared to yield the optimal solution for the overall problem. The results indicate the feasibility of using only primary treatment plants plus dilution water along with the assimilative capacity of the unconfined aquifer for waste water degradation. (Snyder-California) W74-08152

ECOLOGICAL HISTORY OF WETLANDS. Yale Univ., New Haven, Conn. Dept. of Biology. For primary bibliographic entry see Field 2L.

PRELIMINARY SYSTEM DEVELOPMENT--CHEMICAL HAZARDS RESPONSE INFORMA-TION SYSTEM (CHRIS), APPENDIX VII-SUP-PORTING INFORMATION.

PORTING INFORMATION.
Little (Arthur D.) Inc., Cambridge, Mass.
Available from NTIS, Springfield, Va. 22151, as
AD-757 474, Price \$3.00 printed copy; \$1.45
microfiche. Final Contract Report to U.S. Coast
Guard Office of Research and Development, Append VII, May 1972. 237 p, 17 fig, 17 tab, 222 ref. DOT-CG-03-223A.

Descriptors: *Water pollution sources, *Chemical wastes, *Hazards, *Warning systems, *Information retrieval, Documentation, Publications, Methodology, Path of pollutants, Bibliogra-

Identifiers: *Chemical spill response, Chemical hazards, System development, Accidental chemi-

This appendix to the Final Report on the Preliminary System Development of a Chemical Hazards Response Information System (CHRIS) contains the results of studies that led to the development of the CHRIS concept. The results of a survey of user needs and the formulation and analysis of potential information system concepts are presented. A concept for the design of five

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reference guides (manuals) that will form the basic structure of CHRIS is developed. Other supporting information includes reviews of statistics on water pollution incidents, decision processes in-volved in spill response, other hazardous chemical information systems and successes and failures of information retrival systems. A bibliography is included. (Woodard-USGS) W74-08181

A BIBLIOGRAPHY ON THE POLLUTION ASPECTS OF COKE OVENS, British Steel Corp., (Sheffield) (England). Strip

Mills Div.

D. G. Brinn

Available from NTIS, Springfield, Va. 22151 as PB-219 072. Price \$3.00 printed copy; \$1.45 microfiche. Report SM/TN/1/25, February 1973. 10 p. 73 ref.

Descriptors: *Air pollution, *Water pollution, *Bibliographies, *Coal mine wastes, Water pollution sources, Industrial wastes. Identifiers: *Coke ovens.

This bibliography on pollution from coke ovens consists of 73 briefly annotated references from the literature since 1968. For convenience the references are grouped under two headings--Air Pollution Aspects and Water Pollution Aspects. (Knapp-USGS) W74-08183

GROUND WATER POLLUTION FROM SUB-SURFACE EXCAVATIONS: PART III. MORE ON POLLUTION FROM WELLS.

Environmental Protection Agency, Washington, D.C.

Water Well Journal, Vol 28, No 5, p 100-102, May

Descriptors: *Water pollution control, *Waste disposal wells, *Injection wells, Water pollution sources, Earthquakes, Path of pollutants, Ground-

Identifiers: Subsurface waste disposal.

Tangible impacts of waste injection that can be predicted to occur in every case are modification of the groundwater system and introduction into the subsurface of fluids with a chemical composi-tion different from that of the natural fluids. Tangible impacts that could occur in individual cases are degradation of groundwater quality, contamination of other subsurface resources, stimulation of earthquakes, chemical reaction between waste water and natural water, and chemical reac-tion between waste water and rocks in the injection interval. (Knapp-USGS) W74-08184

HYDROGRAPHIC MODIFICATIONS.

Environmental Protection Agency, Washington, D.C. Office of Air and Water Programs. For primary bibliographic entry see Field 5G.

AUTOMATED METHOD FOR ORTHO-, ORTHO-PLUS HYDROLYZABLE AND TOTAL PHOSPHATE IN SURFACE AND WASTE-WATERS, Proctor and Gamble Co., Cincinnati, Ohio.

Ivorydale Technical Center.
For primary bibliographic entry see Field 5A. W74-08208

PRIMARY SLUDGES PRODUCED BY THE AD-DITION OF LIME TO RAW WASTE WATER, Washington Univ., Seattle. Dept. of Civil En-

gineering. For primary bibliographic entry see Field 5D. W74-08224

ANIMAL WASTE UTILIZATION FOR POLLU-TION ABATEMENT TECHNOLOGY AND ECONOMICS. PHASE II,

Nebraska Univ., Lincoln. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 5D. W74-08231

RUNOFF OF OILS FROM RURAL ROADS TREATED TO SUPPRESS DUST

Edison Water Quality Research Lab., Edison, N.J. F. J. Freestone

Environmental Protection Agency National Environmental Research Center Report EPA-R2-72-054, October 1972. 29 p, 6 fig, 7 tab, 3 ref.

Descriptors: *Roads, *Oily water, *Water pollution sources, Runoff, Leaching, Lead, Heavy metals.

Identifiers: *Road oil. *Oiled roads

Oil runoff from two rural roads in Readington Township, Hunterdon County, New Jersey, which are treated with waste crankcase oils, was studied to determine whether or not the oil leaves the road. Roughly 1% of the total oil estimated to have been applied remains in the top inch of road surface material, oil penetration below the top inch of road was minimal, and lead was concentrated in the top inch of road material. Laboratory weathering experiments indicate that estimated maximum weathering loss of oil from a road would be approximately 18%. Runoff studies on simulated rural road surfaces indicated two mechanisms by which oil is transported from the road: leaching of the oil by flotation, and flotation of oil-wet soil particles. The greatest oil transport is during the first few rains after oil application with continuous, low-level leaching during each subsequent rain. Analysis of soil samples taken from a field subjected to runoff from an oiled road showed significantly higher lead content than soil taken from a field 150 feet from the road. (Knapp-USGS) W74-08236

WATER TRANSPORT OF HEAVY METALS IN SOLUTION AND BY DIFFERENT SIZES OF PARTICULATE SOLIDS,

Tennessee Univ., Knoxville. Dept. of Geology.

R. M. Perhac.

Available from the National Technical Information Service as PB-232 427 \$3.25 in paper copy, \$1.45 in microfiche. Tennessee University Water Resources Research Center Research Report No 32, March 1974. 41 p, 3 fig, 22 tab, 23 ref. OWRR A-023-TENN(3)

Descriptors: *Path of pollutants, *Heavy metals, *Sediments, *Water pollution, *Streams, *Tennessee, Cadmium, Cobalt, Copper, Iron, Manganese, Nickel, Lead, Zinc, Colloids, Adsorption, Absorption.

Transport of heavy metals by water and bottom sediments was studied in three streams in east Tennessee. One stream is in an industrialized, urban area; a second flows over exposed car-bonate rocks which contain zinc minerals; the third is in a rural, nonmineralized area. Dissolved solids, particulates, and bottom sediment were analyzed for a suite of heavy metals, principally, Cd, Co, Cu, Fe, Mn, Ni, Pb, and Zn. Most of the heavy metal is transported in solution. The con-centration of metals in the particulates (especially colloids) is very high but the amount of particulate matter is exceedingly low. The amount of heavy metals in the bottom sediment differs considerably from sample to sample. These differences, how-ever, are not reflected in the amount of metal dissolved in the aqueous phase. Within the bottom sediment, the metals seem to be mainly in carbonate lattice positions and, to a limited extent, with free iron oxides. Only very small quantities occur in exchange sites as sorbed cations. As a result, little of the bottom sediment trace metals are available to biota. Both the carbonates and iron

oxides seem to be effective in minimizing the amount of metal which gets into solution. As a result, the natural input of metals into solution is difficult to distinguish from that resulting from man's activity. (Knapp-USGS) W74-08238

SURFACE WATER POLLUTION CONTRACT STUDIES: ADSORPTION OF COMPLEX OR-GANIC MOLECULES BY SUSPENDED CLAY. R. D. Harter, and B. M. Kilcullen.

Available from the National Technical Informa-tion Service as PB-232 415 \$3.75 in paper copy, \$1.45 in microfiche. Completion Report, January, 1970, to June, 1973: New Hampshire University Water Resource Research Center, Durham, Publication, 1973. 66 p. OWRR A-020-NH(3).

Descriptors: *Adsorption, *Clay minerals, *Soil chemistry, *Proteins, *Phosphates, Sorption, Surfaces, Cations, Path of pollutants, Thermodynam-

Identifiers: Adsorption isotherms. calorimetry.

The Langmuir equation is frequently used in at-tempts to explain results of adsorption studies at solid-solution interfaces. Noncompliance to theory or compliance over a limited concentration range is frequently reported. Reasons for these problems are examined, and an experimental method is proposed whereby similar results can be obtained without using the Langmuir equation. Microcalorimetry is useful in studying the heat exchanged during clay-protein interactions. Net heats of reaction were measured in clay-smectite reactions; they are the combination of several reactions at the clay surface. The contribution of each reaction (ion exchange, protein denaturation, etc.) is unknown. (See W74-08240 thru W74-08243) (Knapp-USGS) W74-08239

ADSORPTION STUDIES AT SOLID-SOLUTION

New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.

R. D. Harter.

In: Completion Report, January, 1970, to June 1973: New Hampshire University Water Resources Research Center Publication, p 1-15, 1973. 2 fig, 10 ref. OWRR A-020-NH(3).

Descriptors: *Adsorption, *Clay minerals, *Soil chemistry, *Proteins, *Phosphates, Sorption, Surfaces, Cations, Path of pollutants, Thermodynam-

Identifiers: Adsorption isotherms

The Langmuir equation is frequently used in attempts to explain results of adsorption studies at solid-solution interfaces. Noncompliance to theory or compliance over a limited concentration range is frequently reported. Reasons for these problems are examined, and an experimental method is proposed whereby similar results can be obtained without using the Langmuir equation. To overcome the problems, incremental rather than batch adsorption can be used. An initial adsorbate concentration must be chosen that does not lead to excess concentration dependent adsorption. This solution can then be added to the adsorbent in increments of constant adsorbent-solution ratio, and the equilibrium concentration of each increment carefully measured. In sum, the increments have effectively varied the volume rather than concentration of adsorbate solution, while keeping the adsorbent-solution ratio constant. When lysozyme was adsorbed onto Na-smeetite, it appeared that batch adsorption slightly overestimated the amount of protein which could be adsorbed by the clay surface, even when excess was removed by water washing. When adsorption was conducted by incremental additions, the isotherm broke sharply at a maximum adsorption of 61 mg protein per 50 mg clay. Batch adsorption tended to un-

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derstimate the ability of soil to adsorb phosphorus. (See also W74-08239) (Knapp-USGS) W74-08240

EFFECT OF EXCHANGE CATIONS ON AD-SORPTION OF LYSOZYME AND OVALBUMIN

BY SMECTITE, New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources

R. D. Harter.

In: Completion Report, January, 1970, to June, 1973: New Hampshire University Water Resources Research Center Publication, p 17-25, 1973. 3 fig, 5 ref. OWRR A-020-NH(3).

Descriptors: *Adsorption, *Clay minerals, *Soil chemistry, *Proteins, *Phosphates, Sorption, Surfaces, Cations, Path of pollutants, Thermodynam-

Identifiers: Adsorption isotherms.

Protein adsorption by clays homoionic to the first five elements of the alkali and alkali earth periods, as well as H, Al and La was studied. Adsorption of ovalbumin by smectite is differenct from that of lysozyme adsorbed by the same clay. In no case was an equilibrium condition reached, and in only two cases (adsorption to H- and Be-clay) did the isotherm approach the classical Langmuir form. Constant partition type isotherms are observed when the clay suspension pH is higher than the protein isoelectric point. Apparently, the environment near basic cation-saturated clay surfaces is hostile enough that few ovalbumin molecules were adsorbed. Na is released from Na-saturated clays upon adsorption of ovalbumin, and the surface is thereby modified sufficiently that another increment of ovalbumin can be adsorbed. That the ad-sorption of ovalbumin by clay is pH dependent is further shown by the fact that all except the Hand Be-saturated clays absorbed approximately the same smount of the protein. There was little variation either as a function of valence or size of the ion. (See also W74-08239) (Knapp-USGS)

EFFECT OF SALT CONTENT OF EQUILIBRI-UM-SOLUTION ON FORMATION AND STA-BILITY OF SMECTITE-PROTEIN COM-BILITY OF PLEXES,

New Hampshire Univ., Durham, Inst. of Natural

and Environmental Resources. R. D. Harter.

In: Completion Report, January, 1970, to June, 1973: New Hampshire University Water Resources Research Center Publication, p 27-34, 1973. 2 fig, 2 tab. OWRR A-020-NH(3).

Descriptors: *Adsorption. *Clay minerals. *Soil chemistry, *Proteins, *Phosphates, Sorption, Surfaces, Cations, Path of pollutants, Thermodynam-

Identifiers: Adsorption isotherms.

Proteinaceous pollutants are found in water with salt content ranging from near zero to near satura-tion, and clay-protein complexes already formed are constantly being swept into environments of higher ionic strength. For this reason, the effect of salt concentration on adsorption and stability of complexes to increasing salt concentrations was studied. Sodium chloride solutions of up to 0.1N did not affect the amount of lysozyme that could be adsorbed by Na-saturated smectite. However, NaCl concentrations above 0.1N did interfere with adsorption of lysozyme. The amount of lysozyme that could be adsorbed was progressively reduced, with clay in the presence of 2N NaCl able to adsorb only half as much as was the clay in the presence of 0.1N or less NaCl. Adsorption of protein by clay will probably not be affected by the ionic strength of any freshwater. In brackish or saline water, however, adsorption will be decreased. Since adsorption of protein tends to flocculate suspended clay, with resultant settling out of solution, the decreased adsorption of protein under saline conditions is significant. Proteinaceous pollutants dumped into the ocean or saline lakes are more likely to remain in solution than if they are dumped into freshwater. Once lysozyme was adsorbed, it could not be desorbed by altering the salt concentration. (See also W74-08239) (Knapp-USGS) W74-08242

THE MEASUREMENT OF THE HEAT OF REACTION BETWEEN PROTEINS AND MONT-MORILLONITE BY MICROCALORIMETRY.

New Hampshire Univ., Durham. Water Resources Research Center.

B. M. Kilcullen, and R. D. Harter.

In: Completion Report, January, 1970, to June, 1973: New Hampshire University Water Resources Research Center Publication, p 36-54, 1973. 3 fig. 2 tab, 9 ref. OWRR A-020-NH(2).

Descriptors: *Adsorption, *Clay minerals, *Soil chemistry, *Proteins, *Phosphates, Sorption, Surfaces, Cations, Path of pollutants, Thermodynam-

Identifiers: *Calorimetry, Adsorption isotherms.

Microcalorimetry is useful in studying the heat exchanged during clay-protein interactions. Net heats of reaction were measured in clay-smectite reactions; they are the combination of several reactions at the clay surface. The contribution of each reaction (ion exchange, protein denaturation, etc.) is unknown. (See also W74-08239) (Knapp-W74-08243

BACTERIAL DEGRADATION OF CYCLOHEX-ANE PARTICIPATION OF A CO-OXIDATION PEACTION

Koninklijke/Shell-Laboratorium, Amsterdam

(Netherlands).

H. de Klerk, and A. C. van der Linden.

Antoine von Leeuwenhoek (Journal of Microbiology and Serology), Vol 40, No 1, p 7-15, 1974. 2 fig, 1 tab, 6 ref.

Descriptors: *Biodegradation, *Organic compounds, *Pseudomonas, Investigations, Laboratory tests, Oxidation.

Identifiers: *Cyclohexane, *Cyclohexanol utiliza-

Complete biodegradation of cyclohexane was demonstrated to occur in a system containing two strains of Pseudomonad bacteria, an n-alkane oxidizer and a microorganism utilizing cyclohexanol. n-Heptane also is present as a substrate for the former with neither bacterial strain being capable of utilizing cyclohexane individually. Cyclohexane biodegradation occurs in the following two steps: first, the conversion of cyclohexane into cyclohexanol by the n-alkane oxidizer, and second, through utilization of cyclohexanol by the second strain. Unsuccessful methods used to accumulate a bacterium which could grow on cyclohexane as its sole source of carbon are described. (Sandoski-FIRL)

ENVIRONMENTAL RESEARCH AND

D. Solomon

Public Roads (A Journal of Highway Research and Development), Vol 37, No 8, p 297-305, March, 1974 6 fie

Descriptors: *Environmental effects, *Research and development, *Highway effects, Water pollution sources, Water quality, Sewage treatment, Waste treatment, Pollution abatement, Air pollution ecology.

Identifiers: Noise, Esthetics.

Environmental research completed, underway, or planned under the Federally Coordinated Program

of Research and Development in Highway Transportation is described. Three major research areas are involved in efforts to reduce significant water pollution from highway sources. One is to provide requirements for the quantity of water to be treated and criteria for treatment of wastes at roadside rest areas. Physical, chemical, and biological tests of the water and sewage will deter-mine water quality and effectiveness of the sewage treatment process. A second area of research involves determination of the type and amount of pollutants, their impact on the environment, and methods for controlling pollutants contributed by the highway system. Included are such pollutants as rubber, lead, grease, and oil which collect on the pavement surface and wash into drainage facilities. A third task has as its objective the reduction of damage of water resources through accidental spills of chemicals and other materials. Research on air quality, noise, esthetics and visual quality, and ecological problems is also discussed. (Merritt-FIRL)

THE SURPRISE FACTOR IN MARINE POLLU-TION STUDIES, Scripps Institution of Oceanography, La Jolla,

Calif

E. D. Goldberg.

Marine Technology Society Journal, Vol 8, No 2, p 29-34, February, 1974, 40 ref.

Descriptors: *Oceans, *Water pollution effects, Marine biology, Environmental effects, Biochemistry, Geochemistry, *Biodegradation, *Metals, Organic compounds, *Path of pollutants.

The ways in which pollution studies have contributed to a deeper understanding of biochemistries and of geochemistries occurring within the ocean system are described. Out of a concern to understand man's impact upon his environment, knowledge about the following subjects bearing on marine processes has advanced: the atmospheric transport of large organic molecules from the continents to the oceans, the role of methyl groups in the mobilization of metals and non-metals in biologic systems, the oceans as a source of low molecular weight gases to the atmosphere, bioaccumulation of trace substances by marine organisms, and the biodegradability of organic matter. (Merritt-FIRL) W74-08252

A COMPUTER MODEL FOR PREDICTING NITRATE AND OTHER SOLUTES OF AGRICULTURAL DRAIN WATER, Arizona Univ., Tucson. Dept. of Soils, Water and

Engineering. G. R. Dutt, and M. J. Saffer.

Available from the National Technical Informa-tion Service as PB-211 214 \$3.00 in paper copy, \$1.45 in microfiche. Final report to Bureau of Reclamation, June, 1972. 29 p, 4 fig, 2 append. BR 14-06-D-7328

Descriptors: *Drainage, *Soils, Reclamation, Water quality, Pollutants, Systems analysis, *Computer models, *Path of pollutants, *Nitrates.

A computer simulation model was developed for predicting the changes in solute composition due to chemical reactions in the saturated region below the water table for tile drain systems underlaid by an impermeable layer. The ionic species con-sidered to be present in the water include Ca++, Mg++, Na+, NH4+, SO4=, CI-, HCO3-, CO3=, and NO3-. Chemical reactions considered are base exchange, dissociation or precipitation of gypsum and lime (CaCO3), and reactions between Ca and Mg of sulfate ion pairs in solution. Verification of the model is considered. A procedure for utilizing the above with other models previously developed by the authors and others is outlined. It is con-cluded that the procedure developed is suitable for

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practical application to base saturated soils fitting the boundary conditions. The procedure can be expanded to consider other soils and interactions which may be found to be of importance at a later date. (Skogerboe-Colorado State)
W74-08280

EFFECT OF PHOSPHATE SALTS AS SATU-RATING SOLUTIONS IN CATION-EXCHANGE CAPACITY DETERMINATIONS.

Chile Univ., Santiago. For primary bibliographic entry see Field 2G. W74-08285

RESULTS OF EXAMINATIONS OF HOSPITAL WASTE WATER (ERGEBNISSE DER UNTER-SUCHUNGEN VON KRANKENHAUSABWAES-

Hygiene-Institut des Ruhrgebietz zu Gelsen-kirchen (West Germany). Wasserhygiene Abteilung. H. Althaus.

Oeffentliches Gesundheitswesen, Vol 35, No 2, p 96-105, November 1973. 4 fig, 3 ref.

Descriptors: *Hospitals, *Waste water treatment, *On-site investigations, *Pathogenic bacteria, *Salmonella, Treatment facilities, Disinfection.

Examination of receiving water bodies which receive hospital wastewater resulted in the following findings. Pathogenic germs, particularly salmonella, were found in abundance. However, their presence was at a lesser degree than from those waste water discharged by a residential area, this being attributed to disinfectants being used to treat hospital waste water prior to its release to the public sewer system. If the hospital is not located near a purification plant where waste water receives treatment, then disinfection is practiced at the hospital by heating or chlorination before it is discharged to the receiving streams. (Sandoski-W74-08286

GROUND WATER QUALITY EFFECTS ON DOMESTIC WATER UTILIZATION,

Univ. of Alaska College. Inst. of Water Resources. D. W. Smith, and L. A. Casper. Available from the National Technical Informa-

tion Service as PB-232 535, \$4.75 in paper copy; \$1.45 in microfiche. Office of Water Resources Research, USDI Report IWR-48, March, 1974, 139 p, 63 fig, 10 tab, 48 ref. OWRR A-040-ALAS(1).

Descriptors: Groundwater, *Water costs, Water quality, *Water wells, Water supply, *Wells, Groundwater management, Water utilization, *Alaska, *Cold regions, *Subarctic, Domestic water

Identifiers: Water hauling, *Groundwater quality.

The areal distribution of ground water quality characteristics were examined through the rural domestic water users appraisal of the water and a selected number of chemical analyses. Survey forms were distributed to 6015 rural residents with a 20.9 per cent return. The results are presented in data form and by maps indicating well depths, iron, color, taste and odor problems, and the locations where softeners and filter were reported in use. Chemical analysis for alkalinity, electrical conductivity, Ca, Mg, Fe, Mn, NO-2 + NO=3, and color were run on 83 ground water samples in a selected area. Information was collected on an additional 23 wells. The chemical information had a good correlation with the quality problems indicated by the users. A significant inverse correlation was noted between iron content and nitratenitrite concentration in the well waters. Cost considerations indicate that considerably more attention to ground water supplies is warranted in the interior of Alaska. W74-08287

STUDY PARAMETRIC OF WATER A PARAMETRIC STUDY OF WATER RESOURCE VARIABLES IN A DELTA REGION OF SOUTH LOUISIANA...BAYOU LAFOURCHE VOLUME I - TECHNICAL DISCUSSION, VOLUME II - APPENDICES, Louisiana State Univ., Baton Rouge. Div. of En-

gineering Research.

A. Whitehurst, R. A. Kinney, and A. J.

Available from the National Technical Informa-tion Service as PB-232 521, \$7.25 in paper copy, \$1.45 in microfiche. Final Report; Volume I, 180 p, 50 fig, 29 tab, 53 ref, Volume II, 132 p, 4 append.

Descriptors: *Louisiana, Marshes, Marsh management, *Land use, Water pollution effects, Industrial wastes, *Estuaries, Chemical wastes, Water pollution sources, Analytical techniques, Water resources development, Planning, Management, Runoff, Probability, Open channels, Water supply, Drainage, Sewage, Disposal, Flood con-trol, *Water quality, *Model studies, Water utilization, *Bioindicators.

Identifiers: *Bayou Lafourche(La.) Mississippi

Delta. River diversion.

Bayou Lafourche is the only fresh water source for the population (150,000) of several Parishes in South Louisiana. It is presently under stress due to increased navigation, flooding, and industrial use. The Bayou was modeled both hydrologically and from a water quality viewpoint. Tides and winds proved to be the most influential factors in the movement of the stream, and these factors, coupled with the complexity of the Canal-Bayou-estuary network, generated a unique modeling effort. Energy and momentum relations were used in steady and the 'slowly varying' analyses. Baseline biological indices were established for the Bayou. An attempt to correlate all measured parameters including chemical, biological and hydrological, was made. Land use and water use correlations were made, based primarily on demographic pro-jections. Water needs through 1980 were predicted. W74-08289

DETERMINATION OF OIL LOSS RATES FROM A HIGH SEAS OIL CONTAINMENT BARRIER.

California Univ. Santa Barbara For primary bibliographic entry see Field 5G. W74-08290

IDENTIFICATION AND CONTROL OF POLLUTION FROM SALT WATER INTRUSION.

Environmental Protection Agency, Washington, D.C. Div. of Water Quality and Non-Point Source Control.

Available from Sup Doc, GPO, Washington, DC 20402, price \$1.25. Environmental Protection Agency, Office of Air and Water Programs, Report EPA-430/9-73-013, 1973. 94 p, 11 fig, 16 ref.

Descriptors: *Water pollution control, *Saline water intrusion, Groundwater, Surface waters, *Withdrawal, *Land use, *Consumptive use. Identifiers: Federal water pollution control act.

Saltwater intrusion whether into surface water or groundwater is a complex situation controlled by the geologic and hydrologic characteristics of the area. Natural water systems are dynamic. They respond in quality and quantity to natural phenomena and to man's activities such as changes in land use, stream channel linings, and consumptive withdrawal. Identification and consumptive of the natural of subtwater in consumptive withdrawal. Identification and evaluation of the nature and extent of saltwater intrusion begins with an understanding of the general mechanisms by which intrusion occurs. A basic framework is given for assessment of salt-water intrusion problems and their relationship to the total hydrologic system, to aid State authorities in developing areawide waste treatment management plans. (Knapp-USGS) WATER POLLUTION AND ASSOCIATED EF-

FECTS FROM STREET SALTING, Environmental Protection Agency, Edison, N.J. R. Field, E. J. Struzeski, Jr., H. E. Masters, and A.

Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE2, Paper 10473, p 459-477, April 1974. 9 fig, 3 tab, 100 ref.

Descriptors: *Snow removal, *Deicers, *Water pollution sources, *Urban runoff, *Highways, Water pollution control, Chlorides, Salts.

Excessive application of deicing salts to streets leads to environmental problems. Besides chemical melting, various methods for deicing exist. Some of these are stationary and mobile thermal melting units, alternate deicing compounds, snow adhesion reduction, electromagnetic energy for ice shattering, and drainage systems designed to cap-ture snowmelt for treatment or control. Salt storage facilities often become a major contributing source of local groundwater and surface water salt contamination. High chloride concentration levels have been found in roadway runoff. The special additives in deicing salts may create more severe pollutional problems than the chloride salts. (Knapp-USGS) W74-08306

PREDICTING REAERATION COEFFICIENTS FOR POLLUTED ESTUARY, New Mexico Univ., Albuquerque. Eric H. Wang

Civil Engineering Research Facility. G. R. Kramer.

O. K. Rainier. Journal of the Environmental Engineering Divi-sion, American Society of Civil Engineers, Vol 100, No EEI, Paper 10351, p 77-92, February 1974. 4 fig. 1 tab. 52 ref., append.

Descriptors: *Reaeration, *Estuaries, Water pollution, Oxygen demand, Mathematical models,

Identifiers: *Houston Ship Channel.

Reaeration rate coefficients measured in polluted estuaries were compared to those predicted from equations that predict reaeration coefficients in natural streams. Many of the currently available equations relating K2 with the physical and hydrodynamic characteristics of the waterway are described along with some of the conditions under which they were derived or determined. The effects of wind, temperature, and surface active agents on reaeration are reviewed. A number of the given equations were applied to the Houston Channel in an attempt to predict K2. The predicted K2 was usually less than 1/100 of the measured K2. It is concluded that none of these equations are applicable to the upper Houston Ship Channel area. (Knapp-USGS) W74-08307

SIMULATION OF WATER QUALITY IN TARAWERA RIVER,

Auckland Univ. (New Zealand). School of Engineering. J. C. Rutherford, and M. J. O'Sullivan

Journal of the Environmental Engineering Division, American Society of Civil Engineers, 100, No EE2, Paper 10461, p 369-390, April 1974. 4 fig. 2 tab. 47 ref. append.

Descriptors: *Water quality, *Oxygen demand, *Bottom sediments, *Simulation analysis, *Mathematical models, Reaeration, Industrial astes, Dissolved oxygen. Identifiers: *New Zealand(Tarawera River)

The Tarawera River, New Zealand receives effluent from two paper and pulp mills and exhibits a very high rate of deoxygenation. Biomass accumulates in the river sediments and aerobic metabolism of these organisms on the organic matter in the overlying waters causes the high rate of deox-

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ygenation. A stratified mathematical model uses the Monod equations to predict the rates of growth of bacteria and protozoa in the river sediments. A theoretical multisubstrate system predicts concentrations of dissolved oxygen successfully at varying rates of flow. (Knapp-USGS)

ABSORPTION OF MERCURIC CATION BY TANNINS IN AGRICULTURAL RESIDUES,
Agricultural Research Service, Berkeley, Calif. Western Regional Research Lab. For primary bibliographic entry see Field 5G. W74-08314

RECOVERY OF N15-LABELED FERTILIZERS IN FIELD EXPERIMENTS.

Illinois Univ., Urbana. Dept. of Agronomy. R. L. Westerman, L. T. Kurtz, and R. D. Hauck Soil Science Society of America Proceedings, Vol 36, No 1, p 82-86, January-February, 1972. 2 fig, 3

*Nutrient removal, *Nitrogen, Descriptors: *Leaching, Crop production, Crop response, Crops, Radioisotopes, *Ureas, *Fertilizers. Identifiers: *Oxamide.

Urea and oxamide, each labeled with N15, were compared as fertilizers in two field experiments in adjacent locations in successive years with 'Sudax SX11' Sorghum-sudan hybrid as the test crop. Patterns of uptake of fertilizer N were in accord with the characteristics of the two carriers. In the first harvest in both experiments the amounts of N taken up from urea were markedly greater than from oxamide; but by the third harvests, yield responses and N uptake from oxamide were greater then from urea. Of the N added in urea in the first experiment, 51% was recovered in the crops and 28% was still in the soil (0-25cm) at the end of the growing season. Corresponding figures for oxamide were 52% in the crops and 31% in the soil. In the second experiment, when fertilizer applications and planting operations were delayed until more favorable growing weather, 93% and 99% of the urea- and oxamide-N, respectively, were estimated as recovered in the crops. (Skogerboe-Colorado State) W74-08315

MODLEING OF LAND RUNOFF EFFECTS ON

DISSOLVED OXYGEN, Kansas State Univ., Manhattan, Dept. of Engineering. D. A. Wallace, and R. R. Dague.

Journal Water Pollution Control Federation, Vol. 45, No 8, p 1795-1809, August, 1973. 17 fig, 7 tab,

Descriptors: *Computer models, *Runoff, *Water pollution sources, Mathematical models, *Agricultural runoff, Agricultural watersheds, Water quality, Erosion, *Dissolved oxygen, Farm

A computer mathematical model to estimate the effects of agricultural land runoff on river dissolved oxygen (DO) concentrations has been developed. The Iowa River basin above the Coralville Reservoir was chosen as the area on which to base the model. This area includes 237 miles of main-stem channel and 44 tributaries draining 2,953 square miles. About 90 percent of the area is used for farming operations. The model accounts for both surface and subsurface inflows. Principles of open channel flow are used to describe the flow conditions in the river. The model approximates actual river conditions and is useful in pollution. (Skogerboe-Colorado State) W74-08316 showing the relative effects of different sources of NITRATE REMOVED AT WATER TREAT. MENT PLANT, Bowne (Sidney B.) and Son, Mineola, N.Y

For primary bibliographic entry see Field 5F.

CONCENTRATIONS OF NITROGEN, PHOSPHORUS, POTASSIUM, AND TOTAL SOLUBLE SALTS IN SOIL SOLUTION SAM-PLES FROM FERTILIZED AND UNFERTIL-IZED HISTOSOLS,

Florida Univ., Gainesville. Dept. of Soil Science. Florida Univ., Galhesville. Dept. of Soil Science. C. C. Hortenstine, and R. B. Forbes. Journal of Environmental Quality, Vol 1, No 4, p 446-449, October-December, 1972. 5 fig, 9 ref.

Descriptors: *Water pollution sources, Runoff, Surface runoff, Subsurface runoff, *Agricultural runoff, *Nitrogen, *Phosphorus, *Potassium, Surface Fullor, Subsurface Fullor, Agriculturar runoff, *Nitrogen, *Phosphorus, *Potassium, Nutrient removal, *Peat, Salts, Eutrophication, *Florida, Fertilization, Soils. Identifiers: *Lake Apopka(Fla), Histosols.

Lake Apopka ranked at one time among the most productive bass and panfish bodies of water in the United States. During recent years this lake became eutrophic and fishing declined drastically. Farming operations on the rich organic soil along the northern shore of the lake were implicated as one cause of this eutrophication. To measure agriculture's contributions to the nutrient concentration in the lake, soil solution samples were extracted from uncleared, swampy Everglades mucky peat; newly cleared, drained Everglades mucky peat; and Everglades mucky peat that had been under cultivation for approximately 15 years. Nitrate-N, orthophosphate P, and K concentrations were relatively low in soil solution samples from the swampy area. Concentrations of each nutrient in soil solution extracted at the 60-cm denth in the newly cleared area increased by as much as 8 to 12 times as compared to the 60-cm depth in the swampy area. Further increases were noted in the cultivated area. Indications were that the peat itself was heavy contributor of nutrients to the drainage water. (Skogerboe-Colorado State)

PROCESS KINETICS FOR DENITRIFICATION Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering. For primary bibliographic entry see Field 5D. W74-08320

FATE OF NITRATE FROM MANURE AND IN-ORGANIC NITROGEN IN A CLAY SOIL CROPPED TO CONTINUOUS CORN, Vermont Univ., Burlington. Dept. of Plant and

Soil Science.

J. M. Kimble, R. J. Bartlett, J. L. McIntosh, and K. E. Varney

Journal of Environmental Quality, Vol 1, No 4, p 413-415, October-December, 1972. 5 fig, 1 tab, 6

Descriptors: *Water pollution sources, *Nitrogen, *Nutrient removal, *Denitrification, Leaching, Nitrogen cycle, *Fertilizers, *Nitres, Corn(Field), *Farm wastes, Clays, Soil profiles.

Effects of dairy manure and N fertilizer were studied on plots that had received in a factorial arrangement two levels of manure (0 and 66 metric tons/ha) and two levels of N (0 and 224 kg/ha) applied every spring for 6 years. Laboratory incuba-tion studies using soil profile samples showed potential denitrification to be greater in soil from the manure treated plots than in plots receiving either inorganic N or no N. The amount decreased with depth to 96 cm, below which energy for anaerobic microbial activity appeared to be limiting. Laboratory analyses of profile samples indicated decreasing nitrate-N/chloride ratios at all depths from fall to spring, suggesting that denitrifi-cation rather than leaching was responsible for a significant portion of the nitrate loss during this period. Abrupt decreases in the nitrate-N/chloride ratios from the surface to the 45- to 71-cm depth indicated that denitrification had taken place and that a nitrate bulge at 96- to 122-cm probably was caused by denitrification above that depth. (Skogerboe-Colorado State) W74-08321

INCREASED DENITRIFICATION IN SOILS BY ADDITIONS OF SULFUR AS AN ENERGY

SOURCE, California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
L. D. Mann, D. D. Focht, H. A. Joseph, and L. H.

Stolzy.

Journal of Environmental Quality, Vol 1, No 3, p 329-332, July-September, 1972. 1 fig, 6 tab, 18 ref.

Descriptors: *Denitrification. *Soil amendments. *Leaching, Nutrient removal, *Water pollution sources, Reduction, Oxidation, *Sulfur, Clay loam, Sands, Anaerobic conditions, *Nitrates,

Denitrification rates were studied in four large soil columns using Hanford sandy loam and Moreno silty clay loam soils. One column of each soil was amended with sulfur to serve as an energy source for the bacterium Thiobacillus denitrificans. Limestone was also added as a pH buffer. The other column of each soil was left untreated to serve as a control. A solution of Ca(NO3)2 containing 425 ppm NO3-N was perfused continuously through the columns. The columns were monitored periodically at depths of 10, 30, 50, 70, and 90 cm for nitrate, nitrite, redox potential and microbial numbers. Highly anaerobic conditions developed in all columns. All of the nitrate was reduced in each column, and nitrates penetrated to lower depths in the untreated columns. Nitrite concentrations were found to be negligible. Sulfur additions to field soils which are low in microbial reducing the nitrate level in waters percolating through the profile. (Skogerboe-Colorado State) W74-08322

A SIMPLE DIGESTION PROCEDURE FOR ESTIMATION OF TOTAL NITROGEN IN SOILS AND SEDIMENTS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.

D. W. Nelson, and L. E. Sommers. Journal of Environmental Quality, Vol 1, No 4, p 423-425, October-December, 1972, 5 tab, 12 ref.

Descriptors: *Digestion, *Nitrogen, Nutrients, Fertility, Soils, *Soil chemistry, Soil investigations, Sediments, Analytical techniques, Water pollution sources, Pollutant identification. Identifiers: *Kjeldahl method, Steam distillation,

Hydrofluoric acid.

A simple and convenient digestion procedure for total nitrogen analysis of soils and sediments is described. The digestion is carried out in pyrex Folin-Wu tubes heated in an aluminum block placed on a hot plate. Samples up to 1 g in size may be used and a digestion time of three hours after clearing is adequate. The proposed and conventional semimicro-Kjeldahl methods gave essentially the same values for total N in a wide variety of soils and sediments. The precision of the proposed method was almost as good as those re-ported for other seimicro-Kjeldahl methods. The digestion method allows simultaneous digestion of 60 samples in a relatively inexpensive and maintenance-free aluminum heating block, which occupies a minimum of laboratory space and appears applicable for routine determination of total N in soils having diverse properties. (Skogerboe-Colorado State) W74-08324

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AGRICULTURAL CHEMICALS IN RELATION TO ENVIRONMENTAL QUALITY: CHEMICAL FERTILIZERS, PRESENT AND FUTURE,

Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural and Chemical Development.

Journal of Environmental Quality, Vol 1, No 1, p 2-6, January-March, 1972. 15 ref.

*Water pollution Descriptors: sources. *Fertilizers, *Leaching, Nutrient removal, Runoff, Erosion, *Agricultural chemicals, *Nitrogen, Phosphorus, Potassium.

In the USA, fertilizers have accounted for over 50% of the increase in crop production since 1940, and farmers have substituted fertilizers for land and other inputs. However, considerable controversy has developed in recent years over the role of fertilizers in pollution of natural waters. Increased nitrate and phosphate levels in waters are cited by ecologists as proof of contamination by fertilizers, but this is contested by many agriculturists. Examination by competent reviewers of the limited data available so far indicates that losses of fertilizer nutrients into surface and groundwaters may be minimal under most situa-tions. There are a number of ways to minimize losses without sacrificing the important benefits gained from fertilizers. These include carefully tailoring rates and times of nitrogen application to better fit the needs of the growing crop, greater care in irrigation, use of slow-release nitrogen fertilizers, and wider application of selected soil con-servation practices to control surface losses of both nitrates and phosphates. (Skogerboe-Colorado State) W74-08325

CHEMICAL AND BIOCHEMICAL CONSIDA-TIONS FOR MAXIMIZING THE EFFICIENCY OF FERTILIZER NITROGEN,

Agricultural Research Service, Baton Rouge, La. J. F. Parr.

Journal of Environmental Quality, Vol 2, No 1, p 75-84, January-March, 1973. 6 fig, 2 tab, 56 ref.

Descriptors: *Water pollution sources, *Nitrogen, *Fertilizers, Nutrient removal, Leaching, Salinity, Nitrates, Nitrification, Groundwater, *Water pollution control, Crop production.

Fertilizer nitrogen is subject to loss from the soilroot zone, and immobilization by the soil and rhizosphere microfloras, which can result in low recovery and use efficiency of the applied nitrogen. With increasing rates of application, fertilizer nitrogen efficiency decreases progressively, while leaving an increasing amount of unused nitrogen as a potential pollution hazard. Since the point of greatest economic return from this nutrient is usually somewhere below the point of maximum yield, it should be possible to adjust fer-tilizer nitrogen rates for maximum return and minimum loss to the environment. This can be achieved through improved soil and crop management practices, including proper timing of application of conventional nitrogen fertilizers and use of deep-rooted crops for recovery of leached nitrate. Efficiency of fertilizer nitrogen might also be in-creased with controlled release fertilizers, including the use of coated granules, and compounds of limited water solubility blended with conventional nitrogen fertilizers. (Skogerboe-Colorado State) W74-08326

RECYCLING AND RECOVERY OF NITROGEN, PHOSPHORUS. AND POTASSIUM BY PHOSPHORUS, AND POTASSIUM BY COASTAL BERMUDAGRASS: I. EFFECT OF SOURCES AND RATES OF NITROGEN UNDER A CLIPPING SYSTEM,

Texas A and M Univ., Overton. Agricultural Research and Extension Center.

J. E. Matocha, F. M. Rouquett, Jr., and R. L.

Journal of Environmental Quality, Vol 2, No 1, p 125-129, January-March, 1973. 5 fig, 2 tab, 17 ref.

pollution Descriptors: *Water sources. *Nitrogen, *Fertilizers, Nitrates, Leaching, Nutrient removal, *Coastal bermudagrass, Forages. *Phosphorus. *Potassium, Groundwater, Recycling.

A field experiment was conducted to determine recovery efficiencies for applied N, P, and K under a system of total removal of forage over a 3year period. Ammonium nitrate (NH2)2CO, and (NH4)2SO4 were each applied in split applications of 0, 280, 560, and 840 kg N/ha each season. Soil levels of total N, chemically extractable P, and K monitored each season. Characteristic decreases in recoveries occurred with increasing N rates. Average P recovery percentages for NH4NO3 were 34, 46, and 52% for rates of 280, 560, and 840 kg N/ha, respectively. Plant recovery of applied K was greatest for (NH4)2SO4 and lowest for (NH2)2CO. Average values for (NH4)2SO4 were 108, 165, and 222% for the low, medium, and high rates of N, respectively. Ammonium sulfate gave greater accumulation of soil N with time than NH4NO3 or (NH2)2CO while chemically extractable soil P and K were highest for NH4NO3. (See also W74-08328) (Skogerboe-Colorado State) W74-08327

RECYCLING AND RECOVERY OF NITROGEN, PHOSPHORUS, AND POTASSIUM BY COASTAL BERMUDAGRASS: II. UNDER CONDITIONS WITH

STOCKING RATES,
Texas A and M Univ., Overton. Agricultural Research and Extension Center.

F. M. Rouquette, Jr., J. E. Matocha, and R. L.

Journal of Environmental Quality, Vol 2, No 1, p 129-132, January-March, 1973. 3 fig, 1 tab, 27 ref.

Descriptors: *Water pollution sources, *Fertilizers, *Nitrogen, *Phosphorus, *Potassium, Nutrient removal, Leaching, *Coastal bermu-Pastures, Forages, Groundwater. dagrass, Recycling.

The effect of two stocking rates on the recycling of N, P, and K was studied for 2 years on a Coastal bermudagrass. Samples for chemical analysis were taken at 14-day intervals. Available forage, forage yield, and forage consumption were estimated from samples taken at 2- to 4-week intervals. Soil samples were taken prior to, during, and at termination of the grazing trial. Plant nutrient recycling on the high stocked pastures were approximately twice as great during the dry, 1969 season and about 10% higher during the 1970 season compared to that on the low stocked pastures. Recoveries of applied plant nutrients averaged over stocking rates were 84, 50, and 155% for N, P, and K, respectively, during 1969, and 180, 73, and 172% for N, P, and K, respectively, during 1970. There was a substantial soil accumulation of plant nutrients under both stocking rates with a considerable advantage in favor of the high stocked pastures. (See also W74-08327) (Skogerboe-Colorado State) W74-08328

MOVEMENT OF NITRATE NITROGEN IN SOME GRASSLAND SOILS OF SOUTHERN AL-

Department of Agricultural, Lethbridge (Alberta). Research Station.
T. G. Sommerfeldt, and A. D. Smith.

Journal of Environmental Quality, Vol 2, No 1, p 112-115, January-March, 1973. 5 fig, 3 tab, 14 ref.

Descriptors: *Water pollution sources, *Nitrogen, *Grasslands, Grasses, Leaching, Nutrient removal, Leaching, *Canada, Salinity, Ground-water, Fertilizers, Soils, Loam, Bromegrass, Alfalfa, Sands.

The downward movement of NO3-N in dryland soils under native grass 6 to 8 years after N was applied at rates up to 976 kg/ha reached a depth of 180 cm. Phosphorus fertilizer did not affect NO3-180 cm. Phosphorus tertilizer did not affect NO3-N movement. Under seeded grases, there was no evidence of NO3-N accumulation 2 years after a single application of N at rates up to 944 kg/ha. After repeated annual applications of N that totaled up to 3776 kg/ha over a 4-year period, NO3-N accumulations were found to depths of 90 to 120 cm. The depth of NO3-N movement under hympergrass, was similar to that under created bromegrass was similar to that under crested wheatgrass, but more NO3-N accumulated in the soil under the bromegrass. In irrigated soil under-laid by drains, NO3-N leaching was greater in a loam soil over till growing a mixture of bromegrass and alfalfa than in a loam soil over sandy loamloamy sand growing an irrigated pasture-grass mixture. These studies indicate that, with good management, fertilizer N on grassland soils is not an important contributor to pollution in semiarid southern Alberta. (Skogerboe-Colorado State)

CHEMICAL DISTRIBUTION OF RESIDUAL FERTILIZER NITROGEN IN SOIL REVEALED BY NITROGEN-15 STUDIES, SOIL.

Langston Univ., Okla. Dept. of Agriculture. A. L. Allen, F. J. Stevenson, and L. T. Kurtz. Journal of Environmental Quality, Vol 2, No 1, p 120-124, January-March, 1973. 5 fig, 18 ref.

Descriptors: Water pollution sources, *Nitrogen, *Fertilizers, Leaching, Nutrient removal, Nitrates, Radioisotopes, Salinity, Groundwater, *Soil analysis, *Distribution patterns, *Path of

Chemical distribution patterns were obtained for the residual N in field plots previously amended with N15-labeled urea and oxamide. From 25 to 40% of the fertilizer N was present in the soil (0 to 25 cm) after the first growing season, about half of which still remained after 5 years. Essentially all of the fertilizer-derived N occurred in organic combination; only a small fraction was accounted for in inorganic forms, chiefly as fixed NH4. In comparison to the native humus N, higher percentages of the fertilizer N left after the first growing season occurred as amino acids and amino sugars; lower percentages occurred in acid-insoluble forms, as acid-hydrolyzable organic NH3, and as unidentified acid-soluble N. Considerable humifi-cation occurred during the subsequent 4 years with relocation of amino acids N to more resistant humus forms. The findings suggest that fertilizer N, once incorporated into soil organic matter, becomes increasingly stable with time and is not readily mineralized or subject to leaching. (Skogerboe-Colorado State)

RECIPIENT CAPACITY TO LIMIT DISCHARGE OF POLLUTANTS TO RECEIV-ING WATERS.

Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.

Indian Journal of Environmental Health, Vol 15, No 3, p 200-207, July 1973. 2 fig, 2 tab.

Descriptors: *On-site investigations, *Evaluation, *Monitoring, Aquatic environment, *Water quality control, *Waste assimilative capacity, Discharge measurement.

Two field studies indicative of techniques which can be adopted to determine the assimilative maximum of pollutants into an aquatic environment are presented. Evaluation of recipient capacity of receiving waters is very important as a mode of surveillance to indicate if any unacceptable deterioration in water quality has occurred. A need for development programs to look into wastes generation aspects as a part of the total design is stressed.
(Sandoski-FIRL) W74-08351

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MODEL STUDIES ON REACTIONS OCCUR-RING IN OXIDATIONS OF LIGNIN WITH MOLECULAR OXYGEN IN ALKALINE MEDIA, Vienna Univ. (Austria). Institut fuer Anorganische

Chemie

K. Kratzl, P. Claus, W. Lonsky, and J. S. Gratzl. Wood Science and Technology, Vol 8, No 1, p 35-49, 1974, 12 fig. 47 ref.

Descriptors: *Lignins, *Oxidation, *Model studies, Measurement, Alkalis(Bases), Kinetics, *Degradation(Decomposition), Decomposing organic matter.

Identifiers: Molecular oxygen, Critical Oxidation **Potentials**

The degradation of lignin in oxidation with molecular oxygen is discussed emphasizing the radical (homolytic) or one-electron transfer-oxidations in the initial phase of the basic reaction. The critical oxidation potentials (COP) according to Fieser represent a useful measure for the ease of electron release from lignin-related phenolic models. At low alkalinity rough correlations were observed between the measured COPs and the initial oxygenation rates. The results obtained from quantum mechanical calculations of critical oxidation potentials are discussed briefly. The importance of phenoxy radicals and the hypothetical cyclohexadienone hydroperoxides as inter-mediates is outlined in view of such degradation reactions as oxidative side-chain eliminations. demethoxylations, and splitting of aromatic rings. (Sandoski-FIRL) W74-08359

ESTIMATION AND **EVALUATION** RADIOACTIVE CONTAMINATION THROUGH A FOOD WEB IN AN AQUATIC ECOSYSTEM (1), AN APPLICATION OF THE COMPART-MENT MODEL TO TRANSFER OF RADIOAC TIVE SUBSTANCES THROUGH A FOOD CHAIN.

Kyoto Univ. (Japan). Dept. of Sanitary Engineer-

I. Aoyama, and Y. Inoue.

Journal of Radiation Research, Vol 14, No 4, p 375-381. December 1973. 11 ref.

Descriptors: *Food chains, *Radioactive wastes, Radioactive waste disposal, Aquatic environment, Fish, Predation, Prey fish, Investigations, *Food webs, Ecosystems, Model studies, Absorption, *Cesium, *Radioisotopes. Identifiers: *Japan.

A transfer of radioactive substance through a food chain in an aquatic ecosystem was analyzed through application of modified three compartment model of Aten's. The modification consists of an excretion of radioactivity from Fish-I (preys) to sea water and an direct uptake of radioactivity by Fish-2 (predator) from sea water. In the experimental system, pike cichlids and minnows were used as predators and preys, and the Cesium 137 isotope was used as a radionuclide in the system. The accumulation of 137 Cs in pike was explained by application of the modified model and various parameters in the model were determined. The transfer or a radionuclide through a food chain can be estimated by knowing the uptake rate and the turnover rate of the predator. In ecological terminology they are a daily average ration and an assimilation rate respectively. (Merritt-W74-08365

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE RIO GRANDE BASIN, TEXAS, Geological Survey, Austin, Tex.

H. B. Mendieta. Texas Water Development Board Report 180, March 1974. 109 p, 10 fig, 11 tab, 48 ref.

Descriptors: *Water quality, *Rio Grande River, *Texas, Irrigation water, Return flow, Salinity, Water pollution sources, Geochemistry, Water chemistry, Leaching, Hydrologic data.

The kinds and quantities of minerals dissolved in surface waters of the Rio Grande basin are related principally to the geology of the area and return flow from irrigation. During periods when the flow consists principally of seepage from the Quaternary deposits and return flow from irrigation, water in the upper reach of the Rio Grande usually is slightly saline and very hard. Water in the01W74-W74-08373

r domestic supply and many industrial uses. The sodium hazard of water in the Rio Grande usually ranges from low to medium; that of the Pecos River usually is very high. The salinity hazard of

water in the Rio Grande and Pecos River usually is high or very high. (Knapp-USGS) For primary bibliographic entry see Field 5B. solved solids and sulfate in the Rio Grande upstr

MEASUREMENT OF DYE CONCENTRATIONS BY PHOTOGRAPHY,

California Univ., Berkeley. Dept. of Civil Engineering. For primary bibliographic entry see Field 2E.

W74-08376

TRACER SIMULATION OF SOLUBLE WASTE CONCENTRATION, Geological Survey, Washington, D.C. Water

Resources Div.

N. Yotsukura, and F. A. Kilpatrick.

Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE4, Paper 9947, p 499-515, August 1973. 8 fig, 1 tab, 14 ref, append.

Descriptors: *Tracers, *Dispersion, *Path of pollutants, Degradation(Decomposition), Mathematical models, *Simulation analysis, Estuaries. Identifiers: Radioactive tracers.

The transport of solute in rivers and estuaries can be described by a linear convective diffusion equation. Therefore, the principle of linear superposition can be applied to the dispersion data obtained from a short-term prototype tracer test in order to simulate the concentration buildup of a soluble waste resulting from its long-term release. The assumptions are that both tracer and waste decay according to the first-order reaction rates and that the flow is repetitive with a certain period, which may range from a multiple of tidal cycle for an estuary to an infinitesimal time for a steady river flow. Equations are derived to relate observed tracer concentrations to simulated waste concentrations. Examples of field application are presented. This simulation method is quite feasible for a quick and direct pollution assessment under proper conditions. (Knapp-USGS) W74-08377

TRANSVERSE DISPERSION IN OCILLATORY CHANNEL FLOW.

British Columbis Univ., Vancouver. Dept. of Civil Engineering. P. R. B. Ward.

Journal of the Hydraulics Division, Vol 100, American Society of Civil Engineers, No HY6, Paper 10589, p 755-772, June 1974. 9 fig, 2 tab, 17

Descriptor: *Dispersion, *Estuaries, *Turbulence, Meanders, Dye releases, Hydraulic models, Tides, *Path of Pollutants, Tracers, Open channel flow. Identifiers: *Secondary flow.

In homogeneous estuaries, the dimensionless transverse dispersion coefficient is large compared with results in steady flow in straight channels. Transverse currents of three kinds are responsible for the large coefficients. The results of laboratory tests with oscillatory flow in meandering channels are described. Point injections of dye and subsequent measurements of the dye cloud were made. These results support the hypothesis that the transverse currents cause the large transverse dispersion coefficients. The results suggest that the spiral secondary currents associated with the channel meanders are the principal reason for the large coefficients. (Knapp-USGS) W74-08389

ENHANCED DISPERSION IN DRAG REDUC-ING OPEN CHANNEL FLOW, Clemson Univ., S.C. Dept. of Chemical Engineer-

J. P. Peterson, W. E. Castro, P. B. Zielinski, and W. F. Beckwith.

Journal of the Hydraulics Division, Vol 100, American Society of Civil Engineers, No HY6, Paper 10622, p 773-785, June 1974. 8 fig, 2 tab, 10

Descriptors: *Dispersion, *Open channel flow, *Path of pollutants, Turbulence, Hydraulics, Diffusion.

Identifiers: *Dray reduction, Polymers, Dragreducing additives.

Effects of high polymer drag reducing additives on turbulent dispersion was studied in open channel flow. Theoretical analysis shows that the dispersion coefficient should be greatly enhanced in a drag reducing flow. The data obtained for the longitudinal turbulent dispersion coefficient increases with increasing polymer concentration for dilute polymer solutions at a given Reynolds number. In water and dilute polymer solutions the dispersion coefficient varies linearly with the Reynolds number for each concentration. Above a Reynolds number of 10,000 the dispersion coefficient could be predicted from theretical equations with a single empirical constant. (Knapp-USGS) W74-08390

TOXICITY OF SULPHATE PULP BLEACHING EFFLUENTS,
Finnish Pulp and Paper Research Inst., Helsinki.

For primary bibliographic entry see Field 5C. W74-08403

A NEW ASPECT OF POLLUTION: INCREASE IN THE SALINITY OF WATER DURING ITS USE IN MILLS (UN NOUVEL ASPECT DE LA POLLUTION: LA SALINITE AJOUTEE A L'EAU AU COURS DE SON UTILISATION DANS LES USINES), G. Djiniadhis.

La Papeterie, Vol 95, No 6, p 458, 461, June 1973.

Descriptors: *Salinity, *Water quality, *Waste water(Pollution), *Pulp wastes, *Industrial water(Pollution), *Pulp wastes, *Industrial wastes, Discharge(Water), Rivers, Europe, Pulp and paper industry, Water pollution sources, Water pollution effects, Impaired water quality. Identifiers: *France(Seine River).

Surface water salinity caused by pulp and paper mill effluent discharges is discussed as another form of water pollution, exemplified by the increased salinity of the Seine River in France. The kinds and amounts of salts discharged by various mills are indicated, and the costs of this pollution to industrial users of polluted river water are described. (Speckhard-IPC) W74-08404

Group 5B-Sources Of Pollution

WASTE WATER PROBLEMS OF THE TEX-TILE INDUSTRY. PART I. OXYGEN DEMAND OF PRINTING PASTE THICKENERS.
(PROBLEMI INERENTI LE ACQUE DI SCAR-ICO NELL'INDUSTRIA TESSILÈ. IO. LA DO-MANDA DI OSSIGENO DI ADDENSANTI DA

STAMPA), Stazione Sperimentale per la Cellulosa, Carta e Fibre Tessili Vegetali ed Artificiali, Milan (Italy). Laboratorio Analisi delle Acque. L. d'Angiura, and L. Vicini.

Tinctoria, Vol 69, No 12, p 442-445, 1972. 6 tab, 9

Descriptors: *Water pollution sources, *Biodegradation, *Textiles, *Industrial wastes, *Carbohydrates, *Cellulose, *Resins, Biochemical oxygen demand, Chemical oxygen demand, Oxygen demand, Effluents, Pollutants, Polymers. Identifiers: Starch, Cellulose ethers, Cellulose derivatives, Carboxymethylcellulose, Thickening agents(Chemicals), Printing inks, Alginates, Polyacrylic acid.

Thickeners in the form of chemical solutions or emulsions are usually added to textile printing pastes and are later washed out of the printed fabrics, thus adding to the BOD of discharged effluents. Experimental solutions (0.25 g/liter) of various common thickeners were prepared and tested for COD and BOD. The results showed that carboxymethylcellulose, polyacrylic acid, and alginate were difficult to oxidize, whereas alkyl cel-luloses and converted (degraded) starches are fairly sensitive to permanganate oxidation at both high and low temperatures. The 7-day BOD of degraded starch was 430, that of a branched-chain alkyl cellulose was only 50 mg of oxygen per gram. (Stapinski-IPC) W74-08421

CELLULOSIC DEPOSITS IN BENTHAL EN-VIRONMENTS: OCCURRENCE, EVOLUTION, AND DECOMPOSITION,

Institute of Paper Chemistry, Appleton, Wis. Tappi, Vol 57, No 1, p 120-124, Jan 1974. 2 fig, 1 tab, 17 ref.

Descriptors: *Pulp wastes, *Biodegradation, *Cellulose, *Benthos, Rivers, Self-purification, *Wisconsin, *Sludge, *Anaerobic conditions, Fibers(Plant), Microorganisms, Benthic flora, Aquatic microbiology, Radioisotopes, Carbon radioisotopes, Tracers, Water pollution sources, Water pollution effects, Waste assimilative capacity, Streamflow, Scour, Sediments, Surveys.
Identifiers: *Fox River(Wis), Groundwood,
Mechanical pulps, Chemical pulps.

The occurrence and evolution of fibrous sludge beds in the Lower Fox River (Wisconsin) were explored over a period of ca. 2 years. Simultaneously, anaerobic decomposition of fibers in the sludges was investigated under controlled labora-tory conditions. Sludge beds were found to cover 50% of the river bottom under average conditions. A linear flow rate of 1 ft/sec was found to be a suitable criterion for prediction of fiber deposition. Monitoring of one selected bed for 20 months led to the conclusion that anaerobic decomposition of fibers proceeds at rates comparable to those of deposition. The variation of organic content with temperature indicated a lower microbiological activity during the colder fall and winter, and a sig-nificant activity rise in warmer periods. Most of the fibers in sludge beds derived from mechanical pulp (groundwood), suggesting that the lifetime of chemically pulped fibers in benthal strata of the Lower Fox is quite short. Rates of anaerobic decomposition were measured by incubating sludge samples in a Warburg apparatus and monitoring the evolution of methane and carbon discre toring the evolution of methane and carbon dioxide. Effects of environmental variables were established by perturbing particular variables and comparing the resulting responses to those of control systems. Radiotracer studies with C14-labeled

cellulosic material confirmed the anaerobic decomposition mechanism and established that the degradation rates are higher for chemical than for mechanical pulps. An upper limit of ca. 2 years was established for the lifetime of fibers in the benthal sludge bed monitored. (Brown-IPC)

POLLUTION OF THE DRAMMENS RIVER BY THE WOOD-PROCESSING INDUSTRY (TREFOREDLINGSINDUSTRIENS TIL DRAMMENSVASSDRAGET),

Norsk Skogindustri, Vol 27, No 11, p 324-327, Nov 1973.

Descriptors: *Pulp wastes, Europe, *Water pollution sources, *Water pollution control, Pulp and paper industry, *Water conservation, Treatment facilities, *Waste water treatment, Industrial wastes, Pollutants, Waste water(Pollution), Organic loading, Fibers(Plant), Carbohydrates, Lig-nins, Suspended solids, Dissolved solids, Filtration, Sedimentation, Flotation.

Identifiers: *Norway(Drammens River), White water, Paper mills, Paper machines, Savealls, Fiber recovery, Fines(Fine fibers).

Pollutants in the Drammens River in Norway include suspended organic matter (fiber debris), in-organic fillers, and dissolved organic compounds, notably carbohydrates and lignin. Among methods proposed for reducing any further pollution by pulp and paper mill discharges are: recirculation of paper-machine white waters so as to reduce fresh-water intake; filtration; sedimentation; and flotation savealls for fines (fine fiber) recovery. The economics of appropriate effluent treatment installations are also mentioned. (Brown-IPC) W74-08428

APPRAISAL OF THE WATER RESOURCES OF EASTERN PALM BEACH COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla.

For primary bibliographic entry see Field 4B.

MODEL STUDY OF THE DILUTION OF SOLU-BLE LIQUIDS DISCHARGE FROM TANKERS, Stevens Inst. of Tech., Hoboken, N.J. Davidson Lab

J. A. Mercier, R. I. Hires, and M. Wu. Available from NTIS, Springfield, Va. 22151 as AD-768 681; Price \$4.25 printed copy; \$1.45 microfiche. Final Contract Report No CG-D-12-74, to Department of Transportation, United States Coast Guard, September 1973. 115 p, 68 fig, 3 photo, 9 tab, 10 ref.

Descriptors: *Path of pollutants, *Dispersion, *Solutes, *Ships, Water pollution sources, Water pollution control, Mixing, Model studies, Hydrau-

Dispersion of effluent discharged from chemical tankers was studied in scale models. The effects of location, volume rate, and velocity of discharge were investigated as well as ship speed and propeller action. Discharge should be through the ship's hull at low rates of flow, through large diameter pipes or sea chests. The discharge should be located so that the effluent flows into the central region of the wake and is not affected by bow or bilge vortices. Locations in the region just forward of the engine room and from just below the turn of the bilge or outboard to about the height of the shaft centerline are suggested. For low velocity discharges into the central region of the ship's wake, the concentration of contaminant is approximately proportional to the discharge rate. The dilution is expected to be relatively insensitive to ship displacement and trim if the effluent flows into the central part of the ship's wake and is not affected by bow or bilge vortices. (Knapp-USGS) W74-08451

USE OF HYDROCHEMISTRY FOR INTERPRE-TING GROUND-WATER FLOW SYSTEMS IN CENTRAL NEVADA, Nevada Univ., Las Vegas. Desert Research Inst.

For primary bibliographic entry see Field 2F.

POLLUTION CONTROL OF DISCHARGES INTO RIVERS, STREAMS AND SEA, BP Refinery Singapore Pty. Ltd. For primary bibliographic entry see Field 5G. W74-08469

THE SLOP OIL PROBLEM IN SINGAPORE, Ministry of Science and Technology, Singapore. Industrial Liaison Unit. For primary bibliographic entry see Field 5G. W74-08471

THE CONTROL OF WASTEWATER AND OIL DISCHARGES TO THE SEA WITH PARTICU-LAR REGARD TO STUDIES RECENTLY CAR-RIED OUT IN SINGAPORE'S SOUTHERN COASTAL WATERS, Watson (J. D. and D. M.), London (England).

For primary bibliographic entry see Field 5G.

THE HANDLING OF OIL SPILLS,

Esso Research and Engineering Co., Linden, N.J. For primary bibliographic entry see Field 5G. W74-08474

SEA POLLUTION IN SINGAPORE,

Port of Singapore Authority. K. Chitharanjan.

In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 238-241,

Descriptors: *Oil spills, *Water pollution sources, *Ships, Oily water, Water pollution control, Navigation.
Identifiers: *Oil tankers, *Singapore.

The sea pollution problem in Singapore involves pollution that emanates directly from a variety of sources within the territory of Singapore and the constant threat posed by international shipping, particularly tankers. Ocean-going ships and tankers could cause disastrous pollution as a result of collision and grounding. Such a threat is greater now than ever before owing to the general increase in the world shipping tonnage and the continuing increase in the size and draft of tankers. The other factor which has a detrimental influence on the general situation is the configuration of the waterway around the Republic where bottlenecks exist on the west, south and east. (See also W74-08454) (Knapp-USGS) W74-08475

WATER POLLUTION AND ENVIRONMENTAL HEALTH, Ministry of Health, Kuala Lumpur (Malaysia).

For primary bibliographic entry see Field 5G. W74-08479

WATER POLLUTION IN THAILAND, Applied Scientific Research Corp., of Thailand, Bangkok. Environmental and Ecological Research

For primary bibliographic entry see Field 5G. W74-08483

Sources Of Pollution—Group 5B

SEA POLLUTION-SOME ASPECTS AND THE

Indonesian Petroleum Inst., Djakarta.

W. Wisaksono.

In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 321-329, 1972. 1 tab, 23 ref.

Descriptors: *Oil spills, *Oily water, Oil wastes, Oil industry, Water pollution control, Water pollution effects. Identifiers: *Indonesia.

Indonesian waters generally are relatively clean. Areas with a relatively higher degree of hydrocar-bon or oil pollution are the southern areas of the Billiton Island Group, the Bay of Djakarta, the northern coasts of Java, North Sulawesi, waters in the northern part of Lombok Island, and Birdhead Bay of West Irian. (See also W74-08454) (Knapp-W74-08485

PROGRESS EVALUATION MEETING IN THE MATTER OF POLLUTION OF THE IN-TERSTATE WATERS OF THE MISSOURI RIVER, OMAHA, NEBRASKA AREA (NEBRASKA-IOWA-MISSOURI-KANSAS). Federal Water Pollution Control Administration,

Washington, D.C.

For primary bibliographic entry see Field 5G. W74-08529

REPORT ON THE SECOND SESSION OF THE CONFERENCE IN THE MATTER OF POLLUTION OF THE SOUTH PLATTE RIVER BASIN. Federal Water Pollution Control Administration, Washington, D.C.

For primary bibliographic entry see Field 5G.

DISTRIBUTION OF FLUORIDE IN WATERS OF TOKYO BAY, Nagoya Univ. (Japan). Water Research Lab. Y. Kitano, and T. Furukawa.

J Oceanogr Soc Jap. Vol 28, No 3, p 121-125, 1972, Illus

Identifiers: Bays, *Chorinity, Distribution pat-terns, *Fluoride distribution, *Japan(Tokoyo Bay), *Path of pollutants, Water pollution sources.

Fluoride concentrations in the waters of Tokyo Bay, Japan, are 0.63-1.27 mg/kg and the fluoride to chlorinity ratios are 6.71-8.76x10-5. Fluoride concentrations in river mouth waters flowing to the western part of Tokyo Bay are 0.15-1.07 mg/1, and western part of 10KyO Bay are 0.13-1.07 mg/l, and the fluoride to chlorinity ratios are 1.4x10-4 to 3.6x10-2. The influence of industrial activities on the fluoride to chlorinity ratios is negligible.--Copyright 1973, Biological Abstracts, Inc. W74-08549

SOLUBILITY OF 1,1,2,2-TETRABROMOETHANE IN WATER AS A FUNCTION OF TEMPERATURE,

Bureau of Mines, Tuscaloosa, Ala. Tuscaloosa Metallurgy Research Lab. J. P. Gooch, E. K. Landis, and J. S. Browning. Bureau of Mines Report of Investigations 7656, 1972. 18 p. 3 fig, 11 tab, 20 ref.

Descriptors: *Water pollution sources, *Halogens,

*Heavy media separation, *Flotation, *Separation techniques, Bromine, Solubility.
Identifiers: *Tetrabromoethane.

The solubility of 1,1,2,2-tetrabromoethane (TBE) in water was determined from 1.0 deg to 97.0 deg C. The data are also necessary in an examination of potential water quality problems associated

with the discharge of effluent streams from an aqueous recovery process, even though, in view of the low threshold vapor phase toxicity of TBE, ac-ceptable levels in discharge streams will be extremely low. A thermodynamic analysis conducted on a system consisting of a TBE phase and a water phase in equilibrium with a vapor phase led to the calculation of the activity coefficient, vapor-liquid equilibrium distribution coefficient, relative volatility, and heat of mixing for saturated solu-tions of TBE in water. (Knapp-USGS)

WASTE DISPOSAL SYSTEMS FROM A GROUNDWATER HYDROLOGY AND POLLUTION POINT OF VIEW,

Ministry of the Environment, Ottawa (Ontario). Water Quality Branch. For primary bibliographic entry see Field 5E. W74-08594

QUALITY OF SURFACE WATER IN THE VICINITY OF OIL EXPLORATION SITES, BIG CYPRESS AREA, SOUTH FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 5A.

RICHARDSON BAY EFFLUENT DILUTION STUDY-A WORKING PAPER. Environmental Protection Agency, San Francisco,

Calif. Region IX. Final Report, January 1971. 14 p, 6 fig, 2 tab.

Descriptors: *Path of pollutants, *Bays, *California, Water pollution effects, Algae, Sewage disposal, Water circulation, *Path of pol-

Identifiers: *San Francisco Bay.

Dilution of effluent from the Richardson Bay Sanitation District sewage treatment plant in San Francisco Bay was measured with fluorescent dye. Rhodamine WT dye was added to the effluent at a continuous rate and its concentration in the receiving water monitored daily until a steady state was achieved. Dilution contours were drawn for both high and low slack waters, and flushing time was measured after cessation of dye injection. Algal growth potentials were measured for various effluent concentrations. Most of the volume of water in the portion of the bay studied was replaced every tidal cycle. During the release period, a steady-state condition was reached when a narrow band of high concentration developed along the shoreline in the vicinity of the outfall. Beyond the outer boundary of the band a steep concentration gradient indicated a limited area of mixing, and beyond this point the water at high tide could only consist of replacement from the outer bay. After termination of the release, the visible band of red disappeared within one day, and within a week only background levels could be increasing or addition of effluent to the bay water gave higher algal growth, with 100% effluent response more than 100 times that of the controls. (Knapp-USGS) W74-08604

AN APPRAISAL OF THE GROUNDWATER RESOURCES OF THE UPPER CAPE FEAR RIVER BASIN, NORTH CAROLINA, Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 4B.

WATEQ, A COMPUTER PROGRAM FOR CAL-CULATING CHEMICAL EQUILIBRIA OF NATURAL WATERS, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 2K.

RATES OF SALT SOLUTION IN THE PERMIAN

Geological Survey, Denver, Colo. For primary bibliographic entry see Field 2K. W74-08608

THE MICROBIAL DEGRADATION OF OIL POLLUTANTS,

Louisiana State Univ., Baton Rouge. Center for Wetland Resources

D. G. Ahearn, and S. P. Meyers

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, 1973. 322p. Report LSU-SG-73-01, SG-04-3-158-19, ONR-N00014-73-C-0066.

*Oil spills, *Oil pollution. Descriptors: *Biodegradation, *Microbial degradation, Water quality control, *Pollution abatement, *Water pollution control, *Pesticides, Environmental effects, Aquatic environment, Aquatic animals, Aquatic plants, Estuarine environment. Identifiers: Seeding oil spills, Bacterial seeding,

Crude oils, Pollutant effects, Marine environment,

Freshwater environment.

Thirty-two papers constitute the proceedings of the workshop which was held to determine the present status of knowledge concerning the use of microorganisms in facilitating oil biodegradation, to assess future areas of investigation, to promote cooperative research projects, and to promote exchange of information. Papers are separately abstracted. (See W74-08610 thru W74-08641) (Sinha-OEIS) W74-08609

MICROBIAL-FACILITATED DEGRADATION OF OIL: A PROSPECTUS, Georgia State Univ., Atlanta. Dept. of Biology.

D. G. Ahearn.

D. O. Alteath.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publicatin No., LSU-SG-73-01, p1-2, 1973.

*Oil pollution, on, *Microbial Descriptors: *Oil " *Biodegradation, *Microbial degradation, *Environmental effects, *Water quality control, *Water pollution control, *Pollution abatement, Food chains. Identifiers: Crude oil.

The increasing dependency of industrialized nations on fossil hydrocarbons will not be appreciably altered in the near future. The current 'energy crisis,' with shortages of oil, will increase requirements for shipping and piping vast amounts of hydrocarbons. Thus, the likelihood of future catastrophic oil pollution will be heightened and chronic oil pollution will continue to be a problem. Practical applications for controlled biodegrada-tion of oil may be developed for transformation of bilge wastes and spent lubricating oils to products not harmful to the environment. Following oil spills, various microbial treatments may be necessary to reduce toxicity and to remove residual oils after mechanical clean-up procedures have been instituted. Presently, defined microbial systems which give a proven increase of oil biodegradation in nature have not been developed. Moreover, neither the immediate or long-term effects of seeding hydrocarbonoclastic microorganisms into the environment have been established. (See also W74-08609) (Sinha-OEIS) W74-08610

MICROBIAL DEGRADATION OF OIL: PRESENT STATUS, PROBLEMS, AND PER-SPECTIVES, Scripps Institution of Oceanography, La Jolla,

C. E. ZoBell.

Group 5B-Sources Of Pollution

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 3-16, 1973. 46 ref.

Descriptors: *Oil spills, *Oil pollution, *Microbial degradation, *Biodegradation, Bacteria, Yeasts, Fungi, Microorganisms, Food chains, Bottom sediments, Water quality control, Pollution abatement.

Identifiers: *Hydrocarbon oxidizers, *Biosynthesis, Seeding oil spills, Tar balls

Virtually all kinds of hydrocarbons are susceptible to microbial degradation under favorable conditions. More than 200 species of bacteria, yeasts, filmentous fungi have been shown to metabolize one or more kinds of hydrocarbons ranging from CH4 to compounds containing more than 40 carbon atoms. Although there is a wealth of information on the occurrence and kinds of oildegrading microorganisms in oil-polluted environments, not much is known about their reaction rates or their intermediate degradation products. A summary is given on: the occurrence of hydrocarbon oxidizers in nature; kinds of hydrocarbon oxidizers; kinds of hydrocarbons oxidized; factors affecting the microbial degradation of oil; criteria for the microbial degradation of oil; biodegradation products; rate of oil degradation; the problem of oil in food chains; artificial seeding of oil spills; and the fate of oil in bottom deposits. (See also W74-08609) (Sinha-OEIS) W74-08611

THRENODY CONCERNING BIODEGRADATION OF OIL IN NATURAL

University Coll. of North Wales, Menai Bridge. Marine Science Labs.

G. D. Floodgate. Proceedings of a Workshop held at Georgia State University, December 4-6 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 17-24, 1973. 25 ref.

Descriptors: *Oil spills, *Biodegradation, *Oil pol-lution, *Microbial degradation, *Ecology, Microorganisms, Evaporation, Chemical analysis. Identifiers: Marine chemistry, Crude oils, Petroleum degradation, Oil degradation, Heterotrophic activity, Marine environment, Solubilization, Photo-oxidation, Mineralization.

A plea for a more ecological approach to the problem of oil degradation--an insistence that when oil is spilled into water, the physics, chemistry and biology of the water must be taken into ac-count. New ideas and new apparatus are required such as Gibbs has used in his semi-open system as a first approach to the problem, and its later developments. Other possible ways of measuring heterotrophic activity as yet unexplored in oil degradation, were suggested by Strickland. Also implied in the present paper is that research on this topic requires the cooperation of microbiologists, oil chemists and marine chemists. It is also a plea for recognition of our ignorance, and of the complexity of the problem. Broad generalizations. whether optimistic or pessimistic, are out of place. Our knowledge of what part microorganisms play in the ecology of estuaries, coastal waters and the deep oceans is at best sketchy. (See also W74-08609) (Sinha-OEIS) W74-08612

HYDROCARBON UTILIZATION CLADOSPORIUM RESINAE, Dayton Univ., Ohio. Dept. of Biology.

J. J. Cooney, and J. D. Walker.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 25-32, 1973. 4 tab, 27 ref.

Descriptors: *Biodegradation, *Oil spills, *Oil pollution, *Fungi, *Microbial degradation. lution, *Fungi, *Micro Ecosystems, Food chains. Identifiers: *Biosynthesis,

Amorphotheca. *Cladosporium resinae, Seeding oil spills, Sub-strates, Soil microflora, Creosote fungus, Kerosene fungus, Deuteromycetes.

Cladosporium resinae resembles a number of hydrocarbon-using bacteria and yeasts in that it grows slowly on hydrocarbons. Moreover, limited growth is obtained on cyclic and aromatic compounds. However, the two strains examined do grow on a variety of substrates. Combinations of hydrocarbons and other nitrogen sources may enhance activity and are under examination. Moreover, somatic growth alone may not be an adequate criterion. C. resinae accumulates hydrocarbons, assimilating and oxidizing them by mechanisms that have been demonstrated for a number of bacteria and yeasts. Results summarized here may provide a beginning for evalua-tion of the role of C. resinae in aquatic and ter-restrial environs, and for determining its potential as a seeding organism for oil slicks. Of equal importance with surface slicks, however, is the need to deal with accumulations of hydrocarbons in sediments. The most refractory hydrocarbons are deposited where they can be toxic to benthic organisms and thus provide a reservoir from which they may enter the food chain. Such bottom accumulations are particularly important in shallow water systems such as lakes, streams, marshes and estuaries. (See also W74-08609) (Sinha-OEIS) W74-08613

MICROBIAL DEGRADATION OF AROMATIC

HYDROCARBONS, Texas Univ., Austin. Dept. of Microbiology. D. T. Gibson, and W. K. Yeh.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 33-38, 1973. 2 fig, 3 tab, 13 ref. NIH-ES000537

Descriptors: *Oil pollution, *Oil spills, *Microbial degradation, *Biodegradation, Bacteria, Mam-

mals, Aromatic compounds.
Identifiers: *Aromatic hydrocarbons, Microbial oxidation, Cis-hydroxylation, I Schizomycetes, Pseudomonas putida. Mutagenesis,

Bacteria capable of growth on benzene, toluene, ethylbenzene, naphthalene and biphenyl were isolated from soil. Mutagenesis led to the isolation of different bacterial strains that will accumulate the initial products of hydrocarbon oxidation. The results obtained suggest that cis-hydroxylation is a common reaction in the microbial oxidation of aromatic hydrocarbons. Differences in mechanisms utilized by bacteria and mammals to oxidize aromatic hydrocarbons are illustrated. Mammals incorporate one atom of molecular oxygen into aromatic hydrocarbons with the formation of arene oxides. Subsequent enzymatic addition of water leads to the formation of trans-dihydrodiols. The latter compounds can undergo NADP+-dependent oxidation to catechols. Bacteria utilize both atoms of molecular oxygen to form cis-dihydrodoils. The cyclic peroxide (dioxetane) intermediate is hypothetical. Oxidation of cis-dihydrodoils is NAD+-dependent and, as with the mammalian system, also leads to formation of catechols. The mechanisms of enzymatic oxygen fixation remain unsolved, and probably will not be resolved until purified enzyme systems are available. (See also W74-08609) (Sinha-OEIS) W74-08614

MICROBIAL DEGRADATION OF OIL AND HYDROCARBONS IN CONTINUOUS CUL-

TURE, State Univ. Coll., Brockport, N.Y. Dept. of Biological Sciences.
P. H. Pritchard, and T. J. Starr.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 39-45, 1973. 1 fig. 3 tab, 7 ref. ONR N0014-73-C-0074.

*Oil pollution, *Biodegradation, Descriptors: *Microbial degradation, *Bacteria *Environmental effects, *Ecosystems, *Oil spills. *Bacteria. Identifiers: *Petroleum hydrocarbons, Substrates, Water insolubility, Continuous culture system, Oil degradation.

Preliminary results are presented which support the proposed use of continuous culture techniques to study oil degradation. Experiments with both pure and mixed bacterial populations have shown that slow but significant degradation rates can be obtained with an undisturbed, two-phase (waterhydrocarbon) system. The study of the degradation of petroleum hydrocarbons in a continuous culture system presents a number of complicated problems, the most obvious of which is the water insolubility of the substrate. The purpose is to describe a continuous culture system, developed in our laboratory, which eliminates many of these problems and allows examination of oil degradation in an open versus a closed system. Using isolate J-10 in pure culture (obtained from batch culture enrichments on octane), degradation rates of 16.2 micro gram of octane consumed per hour were obtained. This rate was determined by following the decrease in percent transmittance of the Sudan III dye in the octane layer. The removal of octane was not due to solubilization or evaporation. The observed rate appears to be a function of the ability of the bacterium to degrade the octane at the hydrocarbon-water interface without the aid of emulsification or physical dispersion. It therefore represented a minimal rate. (See also W74-08609) (Sinha-OEIS) W74-08615

UTILIZATION OF CRUDE OIL HYDROCAR-BONS BY MIXED CULTURES OF MARINE BACTERIA,

Texas Univ., Port Aransas, Marine Science Inst.

H. Kator.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 47-65, 1973. 18 fig, 11 tab, 7

Descriptors: *Oil pollution, *Bacteria, *Oil spills, *Cultures Identifiers: *Oil degradation, Crude oils, Paraf-

Marine bacteria degraded hydrocarbons in crude oils in an enriched seawater medium. Normal and branched paraffins were preferentially utilized. Utilization rates were inversely related to chain length. Rapidly growing oil-degrading cultures consistently dispersed and metabolized thin layers of Louisiana. Kuwait and Venezuelan crude oils in ESW within 24 hours. In summary, n-paraffin degradation patterns were similar for different major crude oils. However, the rates of total nparaffin utilization were significantly larger with the Louisiana crude oil. This oil contains roughly twice the amount of normal paraffins found in Kuwait and Venezuelan crude oils. It is evident that mixed populations of marine bacteria isolated on selected crude oils have a clear preference for normal and then branched paraffins. Inasmuch as hydrocarbon degradation in crude oils is sequen-tial, further research utilizing steady-state conditions (without loss of oil) is required to evaluate the range and rates of hydrocarbons utilized or oxidized in crude oils. (See also W74-08609) (Sinha-W74-08616

MICROBIAL DECOMPOSITION PATTERNS USING CRUDE OIL,

University of Southern California, Los Angeles.

Environmental Geology Program.

B. J. Mechalas, T. J. Meyers, and R. L. Kolpack.

Proceedings of a Workshop held at Georgia State riocecungs of a workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 67-79, 1973. 5 fig, 2 tab, 24 ref. NOAA SG 2-35227.

*Oil pollution, on, *Microbial *Oil spills. Descriptors: degradation, Biodegradation.

*Petroleum hydrocarbons, *Oil Identifiers: degradation, Crude oils, Paraffins.

A mixed culture of microorganisms, acclimated to decomposition of crude oil, was used in a series of incubation experiments to determine the sequence incubation experiments to determine the sequence of microbial degradation in a Santa Barbara, California, crude oil. Microbial degradation of the crude oil is initially characterized by a rapid disapearance of the n-paraffin envelope. This degradation starts with the low molecular weight components and progresses toward the higher molecular weight compounds. The isoprenoids are also progressively reduced simultaneously with the reduction of the paraffins. In addition, the base envelope and fine fingerprint region subsequently undergo degradation and the base envelope becomes progressively skewed toward the higher molecular weight end of the chromatogram. Biodegradation of the Santa Barbara crude oil by a mixed microbial population was initiated simultaneously on all components, but the sequential patterns of decomposition were affected by rate differences. Chromatograms of naturally weathered oils collected from southern California beaches are remarkably similar to chromatograms of oil samples which have undergone extensive microbial decomposition in the laboratory. (See also W74-08609) (Sinha-OEIS) W74-08617

CONSIDERATIONS IN APPLICATION OF MICROORGANISMS TO THE ENVIRONMENT FOR DEGRADATION OF PETROLEUM PRODUCTS,
California Univ., Berkeley. Naval Biomedical

Research Lab.
A. B. Cobet, H. E. Guard, and M. A. Chatigny Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 81-87, 1973. 1 fig, 24 ref. ONR N00014-69-A-0200-1001.

*Oil pollunc... *Nutrients, pollution, *Biodegradation, *Aerosols, *Toxicity, Environmental effects, Invertebrates, Microorganisms, Pathogens, Aquatic plants, Aquatic animals

Identifiers: *Oil degradation, Aerosolization, Oil slicks. Emulsification. Pollution-nutrient.

Considerations in the use of microbial prepara-tions for the degradation of oil pollutants are presented. Besides obvious effects of nutrients on the environment, factors associated with emulsifi-cation of the oil pollutant, i.e., increased solubility and toxicity of the residue, and factors in application of the preparation (aerosolization) are discussed. The presence of potential human or animal pathogens in the microbial preparations used for seeding oil spills can create hazards either during the initial aerosolization or from the secondary aerosolization of spume of spray from the water surface. Biodegradation of an oil slick results in the formation of extracellular metabolic products, the effects of which should be considered. Aerobic biodegradation of the hydrocarbon molecule commences with the incorporation of molecular oxygen into the hydrocarbon. The resulting metabolic products may be more toxic and often have a greater solubility than the precur-sor compound. Biodegradation of an oil slick, emulsified oil, and the soluble fraction could conceivably result in a greatly increased toxic organic load in the water colume due to increased solubility differences of the metabolic products. (See also W74-08609) (Sinha-OEIS)

STUDIES ON THE DEGRADATION OF PETROLEUM BY FILAMENTOUS FUNGI, North Carolina State Univ., Raleigh. Dept. of

Microbiology.

Microbiology.
J. J. Perry, and C. E. Cerniglia.
Proceedings of a Workshop held at Georgia State
University, December 4-6, 1972. Published by
Louisiana State University, Sea Grant Publication
No. LSU-SG-73-01, p 89-94, 1973. 1 tab, 25 ref.

Descriptors: *Oil pollution. *Microbial degradation, *Biodegradation, *Microorganisms, *Fungi,

Nitrogen, Phosphorous. Identifiers: *Petroleum degradation, Crude oils, Hydrocarbon substrates, Filamentous fungi, Mycobacteria, Cunninghamella elegans, Ascomycetes Penicillium zonatum, Ascomycetes Asper-gillus versicolor, Cephalosporium acremonium.

Studies were initiated on the degradation of petroleum by microorganisms maintained in stock culture and originally selected for their ability to grow on hydrocarbon substrates. The results gested that many of the constituent parts of complex petroleum could be utilized by these organisms but none could mineralize a significant part of the oil. It was evident, however, that the fungi available were superior to bacteria in the amount of growth attained on various crude oils. Tests with microbes isolated by enrichment with crude oil as substrate confirmed that fungi were more efficient in our system in mineralizing petroleum hydrocarbons. This report is concerned with several aspects of these hydrocarbon degradation studies. Our results suggest that filamentous fungi might have greater potential than bacteria in cleansing the environment of spilled petroleum. The fungi degrade greater quantities of oil during growth, in part perhaps due to their development as a mat on the surface of the oil. Bacteria and yeasts grow in oil droplets where oxygen and mineral nutrients might be limiting. Another advantage is the ability of fungi to form spores that vantage is the ability over extended periods of time without refrigeration. Spores could be accumulated for use as 'seed' inocula when and where they might be needed. (See also W74-08609) (Sinha-OEIS) W74-08619

MICROBIAL DEGRADATION OF CRUDE OIL AND THE VARIOUS HYDROCARBON AND THE DERIVATIVES,

Canada Centre for Inland Waters, Burlington (Ontario).

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 95-104, 1973. 11 fig, 7 ref.

Descriptors: *Oil spills, *Oil pollution, *Biodegradation, Microbial degradation, Microor-ganisms, *Organic compounds. Identifiers: n-alkane, *Crude oil, Hydrocarbon al-

cohols, Methyl ester, Fatty acids, Alkylbenzenes, Hydrocarbon bacteria.

The utilization of various petroleum products by a crude oil-grown bacterial culture has been studied crude oil-grown bacterial culture has been studied using manometric and gas chromatographic techniques. A comparison of the gas chromatogram before and after growth showed that the n-alkane fraction had been preferentially utilized. Manometric techniques demonstrated that the crude oil-grown cells could also rapidly degrade nalkanes, hydrocarbon alcohols, methyl ester of fatty acids and alkylbenzenes. (See also W74-08609) (Sinha-OEIS)

W74-08620

MICROBES AND PETROLEUM: PERSPEC-TIVES AND IMPLICATIONS, Georgia Univ., Athens. Dept. of Microbiology.

W. R. Finnerty, R. S. Kennedy, P. Lockwood, B. O. Spurlock, and R. A. Young.

O. Spurlock, and R. A. Young. Proceedings of a Workshop held at Georgia State University. December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 105-125, 1973. 20 fig. 4 tab, 30 ref. NSF GB-8208, GB-34120.

Descriptors: *Oil spills, *Oil pollution, *Biodegradation, *Microbial degradation, Metabolism, Food chains, Microorganisms. Hydrocarbon Identifiers: microbiology. Hydrocarbon oxidation, Lipid synthesis, Mem-brane synthesis, Hydrocarbon metabolism, Schizomycetes, Acinetobacter sp., Tar balls, Oil degradation, Carcinogens, Petroleum degradation, Sequestering hydrocarbons, Microbial flora, Cytoplasmic sequestering.

An ultra-structure study of Acinetobacter sp grown on paraffinic and olefinic hydrocarbons demonstrated cytoplasmic sequestering of hydrocarbons. Induced membrane synthesis was additionally demonstrated as a result of hydrocarbon metabolism. Increased cellular and extracellular lipid synthesis was qualitatively and quantita-tively documented during hydrocarbon metabolism. These studies serve to emphasize our lack of detailed knowledge concerning the consequences which may arise from this relationship. A serious problem facing hydrocarbon microbiology today is not so much microbial utilization of volatile petroleum fractions, but rather the biodegradation of resinous tars. These highly complex con-stituents of petroleum appear to be highly refractory to biological degradation so that further and immediate studies are needed to understand the apparent recalcitrant nature of these petroleum constituents. (See also W74-08609) (Sinha-OEIS) W74-08621

DISTRIBUTION AND ABUNDANCE OF OIL-OXIDIZING BACTERIA IN THE NORTH SEA, Biologische Anstalt Helgoland, (West Germany).

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 127-139, 1973. 4 fig, 2 tab. 20

*Oil pollution, Descriptors: *Biodegradation, *Microbial degradation, Water pollution control, *Pollution abatement, Water quality control, Yeasts, Air-water interfaces, Bac-Sediments.

Identifiers: Oil-oxidizing bacteria, Marine heterotrophic bacteria, *North Sea, Elbe River Estuary, Surface films, Beach sands.

Investigations include distribution of oil-oxidizing (and total heterotrophic bacteria) in the waters, surface films, sediments and beach sands of the North Sea in the vicinity of Helgoland and in the River Elbe estuary. Microbial concentrations in unpolluted samples, as great as 10,000,000,000 per liter of sediment, are reported. The results on the abundance of marine oil-oxidizing bacteria at the cable-buoy showed that all 57 samples contained oil-oxidizing bacteria. The average was 53,860 bacteria per liter with the percentage 0.52 to 16.8% of the total number of marine heterotrophic bacteria. Because it is highly unlikely that these large concentrations of bacteria belong to a single species, we can assume that bacteria with different potencies to break down various oil compounds are present throughout the year around Helgoland. The sediment samples collected around Helgoland give very different results. Bacterial numbers fluc-tuate about five orders of magnitude. The data indicate the presence of a large bacterial population

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which is able to decompose different types of hydrocarbons. For two years the lowering of the surface tension due to organic substances in collected surface films was measured. In all cases, a considerably lower value was obtained for dyn/cm compared with the water at 1 m depth. Because oil pollution occurs in the former environment further investigations will be concentrated in the surface film. (See also W74-08609) (Sinha-OEIS) W74-08622

MARINE HYDROCARBONOCLASTIC BACTERIA: TYPES AND RANGE OF OIL DEGRADATION,

Naval Weapons Center, China Lake, Calif. Research Dept.

G. Soli.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 141-146, 1973. 3 tab, 7 ref.

Descriptors: *Bacteria, *Oil spills, *Oil pollution, *Biodegradation, *Microbial degradation, *Pollution abatement, Water quality control, Water pollution control, Nitrogen.

Identifiers: Oil slicks, Oil degradation, Marine bacteria, Hydrocarbon degradation, Hydrocarbonoclastic bacteria, Hydrocarbon oxidation.

Marine bacterial isolates were characterized on the basis of their ability to attack hydrocarbons in a complex synthetic mixture. It is possible to outline the oil degradation range of the organisms by properly balancing the various components. The degree of specialization and adaptation to hydrocarbon oxidation was determined indirectly with different nitrogen sources. (See also W74-08609) (Sinha-OEIS) W74-08618)

BIODEGRADATION OF OIL IN SEAWATER: LIMITING FACTORS AND ARTIFICIAL STIMULATION,

Rutgers-The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.

R. Bartha, and R. M. Atlas.

Proceedings of a Workshop held at Georgia State University, December 4-6,1972. Published by Louisiana State University, Sea Grant Publication No L.SU-SG-73-01, p 147-152, 1973. 2 fig, 1 tab, 9 ref. ONR N00014-67-A-0115-0005.

Descriptors: *Biodegradation, *Oil pollution, *Pollution abatement, *Water quality control, *Water pollution control, *Bacteria, Oil spills, Sea water, Nitrogen, Phosphorus, Nutrients, Water temperature.

temperature. Identifiers: *Oleophilic fertilizer, Crude oil, Oil slicks, Flavobacterium sp., Brevibacterium sp., Schizomycetes.

The limiting factors of petroleum biodegradation in seawater were systematically evaluated. In the surveyed coastal waters, hydrocarbon oxidizers were found to be abundant, but their substrate ranges relatively restricted. Besides lowering the biodegradation rates, low water temperatures caused long lag periods due to retention of volatile inhibitors in crude oil. Nitrogen and phosphorus were found to be severely limiting. Addition of these nutrients dramatically increased oil biodegradation both in laboratory and in field experiments. An oleophilic fertilizer formula for use on floating oil slicks is described. Summarizing some identified or postulated causes that inhibit biodegradation of polluting oil in the sea, ZoBell listed the low numbers of marine hydrocarbon degraders, their limited substrate range, toxic substances in crudge oil, lack of sufficient aeration, lack of adequate dispersion, sub-optimal temperatures, and insufficiency of essential mineral nutrients such as nitrogen and phosphorus. We have evaluated some of these limiting parameters in a quantitative manner in order to define practical approaches toward the stimulated biodegrada-

tion of oil as a pollution abatement technique. (See also W74-08609) (Sinha-OEIS) W74-08624

BACTERIAL DEGRADATION OF MINERAL OILS AT LOW TEMPERATURES,
Scripps Institution of Oceanography, La Jolla,

Calif. C. E. ZoBell.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 153-161, 1973. 2 fig, 3 tab, 17 ref.

Descriptors: *Tundra, *Biodegradation, *Bacteria, *Yeasts, *Fungi, *Water pollution, *Oil pollution, Pollution abatement, Soils, Water temperature, Oil spills.

Identifiers: Bacterial degradation, Mineral oil, Microbial degradation, North Alaska Slope, North Sea. Siberia.

Psychrophilic oil-oxidizing bacteria were demonstrated in 13 samples of oil-polluted water, soil, and tundra muck collected from the North Alaska Slope. Within a week or two there was visual evidence that clear mineral oil was being degraded by bacteria at 8 and 4 C. Such activity became apparent after two to three weeks' incubation at -1.1C, the freezing point of the medium. From oxygen uptake data it was calculated that bacteria oxidized mineral oil at rates ranging from 0.13 to 0.9 mg/liter/day at -1.1 C. Assuming an average generation time of 24 hours, it is calculated that a bacterial population of 1,000,000,000 reproducing cells per ml of mineral oil medium would consume

oil for building biomass at a rate of 1.2 mg/liter/day

at -1.1 C. Nine different crude oils were found to

be slowly attacked by bacteria growing at -1.1 C. (See also W74-08609) (Sinha-OEIS) W74-08625

BACTERIAL DEGRADATION OF PETROLEUM MATERIALS IN LOW TEMPERATURE MARINE ENVIRONMENTS.

Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.

R. W. Traxler.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 163-170, 1973. 3 fig, 3 tab, 4 ref.

Descriptors: *Oil pollution, *Oil spills, *Biodegradation, *Microbial degradation, Environmental effects, *Pollution abatement, Water quality control, Water pollution control, Sediments, Microbiology, *Rhode Island, Bacteria. Identifiers: Obligate marine psychrophiles, *Chedabucto Bay(R.I.), *Narragansett Bay(R.I.), Oil degradation, Psychrophilic temperature range, Aliphatic hydrocarbons, Cyclic hydrocarbons, Aromatic hydrocarbons.

It was found that sediments were a better source of organisms than water column samples. Not only were bacteria present in larger numbers in the sediments but a wider spectrum of genera were obtained from sediment samples. This seems particularly true for Chedabucto Bay which has a faster flushing rate than Narragansett Bay. To day, 49 hydrocarbon-utilizing bacteria were isolated from Chedabucto Bay and 72 organisms from Narragnasett Bay. The capacity of all of these isolates to grow on hydrocarbons was confirmed by development on No 1 Fuel Oil prior to screening studies. The Chedabucto Bay samples were obtained from a 16 to 17 C environment, whereas the Narragansett Bay samples were taken at temperatures of 2.5 to 5 C. (See also W74-08609) (Sinha-OEIS) W74-08626

HYDROCARBON BIODEGRADATION ALASKAN WATERS,

Alaska Univ., College. Inst. of Marine Sciences. B. Robertson, S. Arhelger, P. J. Kinney, and D. K. Button

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 171-184, 1973. 4 fig, 5 tab, 14 ref.

Descriptors: *Oil pollution, degradation, *Biodegradation, Microbial degradation, Estuaries, Sea water, Salinity, Bacteria, Yeast, Microorganisms, Algae, Mixing, Silts, *Alaska. Identifiers: Cook Inlet(Alas), Port Valdez(Alas), Marine microorganisms, Crude oils, Oil slicks, Inoculation, Chemotaxis, Hydrocarbon oxidation, Microbial oxidation, Oil toxicity, Selenastrum capricornutum, Flushing, Solubilization, Incubation temperature, Inoculation frequency, Kerosene.

Populations of hydrocarbon-oxidizing organisms were of the order of 1/cc in Alaska's Cook Inlet and Port Valdez, less in the Artic Ocean. Distribution decreased with salinity in Cook Inlet and with depth in Port Valdez. In situ oxidation of 14-C-dodecane (91 microgram C/liter) started within hours and proceeded at a rate of 1 microgram/literday. Storage of Cook Inlet crude oil for four years in sea water at 10 C effected removal of most visible components. Mixing had a major effect on oil slick stability. The solubilization process was little affected by added silt, a major component of many Alaskan estuaries. Isolated organisms had unique preferences for various components of kerosene, emulsified crude oil and responded in a normal way to incubation temperature, E sub a 14.5 to 16 Kcal/mole. Some effects of crude oil inhibition are discussed. Calculations show that motility, particularly in combination with chemotaxis, is necessary for rapid slick inoculation. In this communication we report observations on the distribution of hydrocarbon-oxidizing organisms, some characteristics of several organisms isolated, rates of hydrocarbons oxidation observed and some estimates of inoculation frequency. (See also W74-08609) (Sinha-OEIS) W74-08627

MICROBIAL ECOLOGY AND THE PROBLEM OF PETROLEUM DEGRADATION IN CHESAPEAKE BAY,

Maryland Univ., College Park. Dept. of Microbiology. R. R. Colwell, J. D. Walker, and J. D. Nelson, Jr.

R. R. Colwell, J. D. Walker, and J. D. Nelson, Jr. Proceedings of a Workshop held at Georgia State University, December 4-6, 1973. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 185-197, 1973. 3 fig, 6 tab, 36 ref.

Descriptors: *Estuaries, *Bacteria, *Oil pollution, *Microbial degradation, *Pollution abatement, *Chesapeake Bay, Inlets(Waterways), Bays, Microorganisms, Ecology, Sediments, Fungi, Actinomycetes, Microbiology, *Maryland. Identifiers: Microbial ecology, Petroleum degrada-

Identifiers: Microbial ecology, Petroleum degradation, Species distribution, Seasonal variations, Baltimore Harbor, Eastern Bay, Substrates, Cladosporium resinae, Microbial flora, Microflora, Deuteromycetes.

Information obtained on the ecology of mercury-metabolizing bacteria in Chesapeake Bay has provided interesting comparisons with the petroleum-degrading microbial populations. Petroleum degradation studies are being done to obtain a seasonal incidence, as well as species distribution of petroleum-degrading microorganisms. It was found that the concentration of petroleum in an oil polluted site in Baltimore Harbor was ca five times greater than in Eastern Bay. The numbers of petroleum-degrading microorganisms, measured by direct and replica plating, in the water and sediment samples were related to the concentration of

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oil in each sample. Total yields of petroleumdegrading microorganisms grown on an oil substrate were greater for those organisms exposed to oil in the natural environment. Microorganisms isolated from water and sediment samples grew on substrates representative of the aliphatic, aromatic and refractory hydrocarbons. From analysis of species distributions, it was observed that a hydrocarbon-utilizing fungus, Cladosporium resinae, and actinomycetes were predominant among the hydrocarbon-utilizing isolates. Microbial degradation of petroleum in Chesapeake Bay appears to be mediated by the autochthonous microbial flora. (See also W74-08609) (Sinha-W74-08628

ALKANE DEGRADATION IN BEACH SANDS, Florida State Univ., Tallahassee. Dept. of

Oceanography. T. E. Ahlfeld, and P. A. LaRock

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 199-203, 1973. 2 tab, 6 ref.

Descriptors: *Oil pollution, *Seepage, *Beaches, *Microbial degradation, *Pollution abatement, Evaporation, Bacteria, *California.

Identifiers: Beach sands, Oil seeps, Coal Oil Point(Calif.), Alkane, Bacterial degradation, Autoxidation, Seeding experiments, Crude oil, Tar.

An estimation of the rate of n-alkane degradation was made in beach sands from Coal Oil Point, California. Bulk sand samples from a beach chronically polluted with oil from natural seeps were extracted and analyzed gas chromatographically and gravimetrically for hydrocarbon content.

Calculations indicate that a maximum degradation of 0.32 g of n-alkane occurs per day for 100 sq m of beach. The oil input on the day of sampling was estimated to be 5 g/100 sq m/day. From these figures it is seen that the daily maximum oxidation, including bacterial degradation, evaporation and autoxidation accounts for only 6% removal of the alkane content of the sand. (See also W74-08609) (Sinha-OEIS) W74-08629

HYDROCARBONS OF SUSPECTED POLLU-TANT ORIGIN IN AQUATIC ORGANISMS OF SAN FRANCISCO BAY: METHODS AND PRELIMINARY RESULTS,

California Univ., Berkeley. Naval Biomedical Research Lab.

L. H. DiSalvo, H. E. Guard, L. Hunter, and A. B. Cobet.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 205-220, 1973. 9 fig, 2 tab, 20

Descriptors: *Organic compounds, Estuaries, Pollutants, Food chains, Aquatic animals, Ecosystems, Embayments, Deltas, Invertebrates, Sharks, *Oil pollution, Bioindicators, *California,

Bays. Identifiers: *San Francisco Bay(Calif). *Hydrocarbon pollution.

Large amounts of petroleum-derived hydrocarbons enter the waters of San Fransisco Bay each year, yet little is known concerning the fate and effects of pollutant hydrocarbons on estuarine organisms and, indirectly, on the human environ-ment of the Bay area. Investigation into fate and effects of petroleum-derived hydrocarbons was initiated by analyzing the hydrocarbon content of selected Bay animals to determine if this served as an indicator of chronic hydrocarbon pollution in Bay food chains. Initial results have been obtained using solvent extracts of sponge, mussel, and crab tissues. Closely related animals were obtained from relatively clean waters along the northern California coast to provide 'unpolluted' control extracts for comparison. To date, it has been shown that Bay organisms have a significantly higher content of hydrocarbons than the clean water organisms. Methods tested included gas chromatography (GC), thin layer chromatography (TLC), fluorescence spectrometry, and high pressure liquid chromatography (HPLC). Comparative results between the different methods suggest thin layer chromatography to be the method of choice. (See also W74-08609) (Sinha-OEIS)

THE IMPACT OF OIL ON MARSHLAND MICROBIAL ECOSYSTEMS,

Louisana State Univ., Baton Rouge. Dept. of Food

For primary bibliographic entry see Field 5C. W74-08631

PRODUCTION AND CHARACTERIZATION OF EMULSIFYING FACTORS FROM HYDROCAR-BONOCLASTIC YEAST AND BACTERIA,

Oklahoma State Univ., Stillwater, Dept. of Biochemistry. P. E. Guire, J. D. Friede, and R. K. Gholson

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 229-231, 1973. 1 fig, 1 tab. ONR N00014-71-A-0004-0001.

Descriptors: *Oil spills, *Oil pollution, *Bacteria, *Yeast, *Pollution abatement, Water pollution control, Water quality control, Microorganisms. Identifiers: *Hydrocarbonoclastic microorgan-isms, Oil degradation, Mineralization, Candida petrophilum, Ascomycetes, Schizomycetes, Pseudomonas aeruginosa, Emulsification.

The chemical conversion of oil polutants to carbon dioxide (mineralization) and water-soluble, non-toxic organic oxidation products is an esthetically performed continuously by microorganisms in natural environments chronically polluted with oil. We are therefore interested in gaining an appreciably greater level of control over the location. rate, and perhaps end products of this biological wet combustion process. A common characteristic of the growth of hydrocarbonoclastic microorganisms in liquid media containing hydrocarbons is the production of hydrocarbon-water emulsion early in the growth phase. Because of the potential value of biodegradable, non-toxic emulsifying factors for accelerating the growth and metabolic processes of microorganisms on oil pollutants, we have examined the production and some pertient characteristics of emulsifying factors from a yeast (Candida petrophilum, ATCC 20226) and a bacterium (Pseudomonas aeruginosa, NCIB 9904) grown on hexadecane. (See also W74-08609) (Sinha-OEIS) W74-08632

THE RELATIVE CHANGES IN N-ALKANE COMPOSITION IN SURFACE WATER SLICKS, Florida State Univ., Tallahassee. Dept. of Oceanography.
P. A. LaRock, and T. E. Ahlfeld.

Descriptors: "Biodegradation, "Microbial degradation, "Oil spills, "Oil pollution, Pollution abatement, Water pollution control, Water quality control, "Louisiana, Bacteria, Evaporation, Dispersion. Identifiers: *Oil slicks, *Alkanes, Hydrocarbon

oxidation, Marine environment.

Preliminary findings are reported here on the changes of n-alkane composition in surface slicks in Barataria Bay, Louisiana. At the locations stu-died, the net movement of water is to the south away from the gas wells in the north, and through Barataria Pass. By sampling away from the producing areas and toward the Pass, qualitative changes in the n-alkanes in surface slicks was followed. The general trend at stations 3, 4, and 6 shows alkanes with a chain length between C-17 and C-20 to be relatively unchanged, whereas C-14, C-16 and C-21 to C-32 show net decreases moving toward the south. This decrease amounted to 50 to 80% for alkanes over C-21. If dispersion were the principal factor in reducing the hydrocar-bon density, little change in the alkane composi-tion would be expected. Evaporation would affect the lower molecular weight material, and thus the changes in concentration of the long chain alkanes must presumably be the result of bacterial degradation. (See also W74-08609) (Sinha-OEIS) W74-08633

ESTUARINE MICROBES AND GANOCHLORINE PESTICIDES (A RDIFF

ental Protection Agency, Gulf Breeze, Fla Gulf Breeze Environmental Research Lab. A. W. Bourquin.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 237-243, 1973. 1 tab, 35 ref. Gulf Breeze Contrib 165.

Descriptors: *Reviews, *Estuaries, *Microbial degradation, Pesticides, Estuarine environment, Ecosystems, *Chlorinated hydrocarbon pesti-cides, Pollution abatement, Water pollution control, Water quality control, Microorganisms, Metabolism, Bacteria, Yeast, Fungi. Identifiers: *Pesticide degradation, Or-ganochlorine pesticides, Synergism, Microbial

synergism.

Following a review of the literature, the author points out that pathways of microbial attack upon chlorinated hydrocarbons in the estuarine environment need to be investigated since breakdown by microorganisms is probably the main natural process of pesticide degradation. Although microbiological processes might reduce environmental pollution attributed to use of persistent pesticides, detailed studies of degradative pathways are required to assess the degree of hazard caused by breakdown products. (See also W74-08609) (Sinha-OEIS) W74-08634

MEASUREMENT OF BASELINE LEVELS OF ENTERIC BACTERIAL ACTIVITY IN RIVER WATER, Georgia Univ., Athens. Dept. of Microbiology.

C. W. Hendricks.

C. W. Hendricks.
Proceedings of a Workshop held at Georgia State
University, December 4-6, 1972. Published by
Louisiana State University, Sea Grant Publication
No LSU-SG-73-01, p 245-258, 1973. 2 fig. 6 tab, 30
ref. EPA Project 16050 EQS.

Descriptors: Enteric bacteria, Rivers, Freshwater, *Bottom sediments, *Oil pollution, Water pollu-tion control, Water quality control, *Pollution abatement, Nutrients, River beds, Dispersion, Oil spills, *Georgia. Identifiers: Pathogens, Substrates, *Oconee River

(Geo), Escherichia coli, Enterobacter aerogenes, Proteus rettgeri, Schizomycetes.

This investigation indicates that natural populations and selected laboratory strains of enteric bacteria, including pathogens, have the capacity to metabolize substrates present in the Oconee River, including autoclaved river water. These organisms, however, lacked the ability to increase in numbers in continuous culture with river water and suspended detritus recovered above a secondary sewage treatment facility, but demonstrated positive growth rates with substrates recovered below the plant. Data also showed that the sands and clays forming the stream bottom had the

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capacity to sorb substrates from the overlayering water, and that sediment cluates stimullated the respiration rate of bacteria. This suggests that the stream bottom can provide a suitable environment for the growth of bacteria and perhaps controls basal nutrient concentration in the water itself. (See also W74-08609) (Sinha-OEIS) W74-08635

SUBLETHAL EFFECTS OF THE WATER SOLUBLE COMPONENT OF OIL: CHEMICAL COMMUNICATION IN THE MARINE EN-VIRONMENT.

Oregon State Univ., Corvallis. Dept. of Zoology. For primary bibliographic entry see Field 5C

SOME ACUTE EFFECTS OF LOW-BOILING PETROLEUM FRACTIONS ON THE CELLU-LAR STRUCTURE OF FISH GILLS UNDER FIELD CONDITIONS.

Texas Wesleyan Coll., Fort Worth. Div. of Science.

For primary bibliographic entry see Field 5C.

INHIBITION OF BACTERIAL CHEMORECEP-TION BY HYDROCARBONS, Harvard Univ., Cambridge, Mass. Lab. of Applied

Microbiology.
For primary bibliographic entry see Field 5C.

W74-08638

DECRADATION OF CRUDE OIL BY VEASTS AND ITS EFFECTS ON LESBISTES RETICU-

Georgia State Univ., Atlanta. Dept. of Biology. For primary bibliographic entry see Field 5C W74-08639

EFFECTS OF SOME COMMERCIAL OIL HER-DERS, DISPERSANTS AND BACTERIAL IN-OCULA ON BIODEGRADATION OF OIL IN SEAWATER,

Rutgers-The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology. For primary bibliographic entry see Field 5C. W74-08640

BACTERIAL. SEEDING TO ENHANCE BIODEGRADATION OF OIL SLICKS,

Texas Univ., Port Aransas. Marine Science Inst. R. Miget.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication LSU-SG-73-01, p 291-309, 1973. 1 fig, 8 tab, 30 ref,

*Oil spills, *Oil on, *Microbial pollution, *Biodegradation, *Microbial degradation, Nutrients, Biochemical oxygen demand, Metabolism, *Water pollution control, Pollution abatement.

Identifiers: Seeding oil spills, Oil slicks, Bacterial seeding, Microbial seeding, Crude oils, Organic carbon, Microbial oxidation.

Evaluations have been made to determine the feasibility of adding selected hydrocarbon-oxidizing bacteria and required nutrient salts to an oil slick to enhance biodegradation of the polluting hydrocarbon. Fifty active mixed cultures lated. Culture characteristics including cell morphology, temperature tolerance, and resistance to chemical dispersants were determined. Biodegradation of adsorbed vs. nonadsorbed oil was compared, and media for mass cultivation of organisms was developed. Simulated field, or tank, experiments showed the effectiveness of microbial seeding varied more with the type and quantity of crude oil used than with such factors as

inoculum density or nutrient salt concentration. Initial 24-hr oil losses were generally twice as large in bacterial seeded tanks relative to uninoculated controls. Biological Oxygen Demand and Total Organic Carbon analyses of tank water indicated little metabolic product pollution of the water. (See also W74-08609) (OEIS) W74-08641

VERTICAL DISTRIBUTION OF FALLOUT CESIUM-137 IN CULTIVATED SOILS,

Agricultural Research Service, Oxford, Miss. Sedimentation Lab.

J. C. Ritchie, and J. R. McHenry.

Available from Supt. of Documents, Washington, D.C., \$1.20 per copy. Radiation Data and Reports, Vol. 14, No. 12, p 727-728, December 1973. I tab,

Descriptors: *Fallout, *Cesium, *Distribution, *Vertical migration, *Soil contamination, Water pollution, Watershed management, Cultivation.

Fallout cesium-137 was found to be evenly distributed in the upper 15-20 cm of cultivated soils of five watersheds in the mid-United States. This distribution pattern is markedly different from the vertical distribution of cesium-137 in noncultivated soils. (Houser-ORNL) W74-08644

RADIOLOGICAL SURVEY OF NEW LONDON HARBOR, THAMES RIVER, CONN., AND EN-VIRONS

Office of Radiation Programs, Washington, D.C.

S.T. Windham, and C. R. Phillips.
Available from Supt. of Doc., U.S. Gov. Print.
Off., Wash., D.C. \$1.00 per copy. Radiation Data
and Reports, Vol. 14, No. 11, p 659-666, Nov. 1973. 8 fig, 7 tab, 2 ref.

Descriptors: *Surveys, *Harbors, *Ports, *Rivers, *Environment, *Radioactivity measurement, Assay, Water pollution, Water pollution sources, Nuclear powerplants, Ships, Connecticut, Popula-tion, Public health, Safety, Evaluation, Path of pollutants, Cobalt radioisotopes.
Identifiers: *New London Harbor, *Thames

In July 1972, the Eastern Environmental Radiation Facility, in cooperation with the U.S. Naval Ship Systems Command, conducted a radiological sur-vey of the New London Harbor, Thames River and environs to determine if nuclear ship activity in that area has contributed radioactivity which could result in detectable radiation exposure to the public. Comparison with a similar survey conducted in 1966 shows that cobalt-60 activity levels in sediment have decreased by an average factor of 33 due to a reduction in the amount of radioactivity discharged, radioactive decay and natural sedimentation. Analysis of samples indicative of direct pathways for human exposure lead to the conclusion that no significant radiation exposure to the public has resulted from nuclear ship operations in this area. It is concluded that the environmental surveillance routinely conducted by the Navy should be adequate to assure protection of the public from the routine nuclear ship opera-tions. (Houser-ORNL)

ENVIRONMENTAL RADIOACTIVITY IN IL-

LINOIS, 1970, Office of Radiation Programs, Washington, D.C. Field Operations Div.

M. J. Shmuklarsky.
Report available from Supt. of Documents, U.S. Govt. Printing Office, Wash. D.C. 20402. \$0.50 per copy. Radiation Data and Reports, Vol 13, No 11, p 589-618, Nov 1972. 3 fig, 30 tab, 46 ref.

Descriptors: *Nuclear powerplants, *Illinois, *Effluents, *Air pollution, *Water pollution,

Water pollution sources, Soil contamination, Fallout, Monitoring, Measurement, Data collections, Assay, Surveys, Background radiation, Radioactivity effects, Public health. Identifiers: Surveillance program.

The contribution of radioactivity to the Illinois environment during 1970 resulting from the opera-tion of nuclear power plants and from other major natural and manmade sources is presented. The environmental surveillance programs of the Dresden, Quad-Cities and Zion nuclear power stations are described. Dresden Unit 1 radioactive gaseous and liquid releases for the past 11 years, and Dresden Unit 2 discharges for 1970 are sumarized. On the basis of data gathered during 1970, it is concluded that the effect of nuclear power plant operations on the radioactivity level of most environmental media was hardly distinguishable from the natural and fallout radioactivity. The only measured environmental radiation effect of nuclear power generation within the State was an apparent increase of a few millirem per year in the external background exposure in the vicinity of Dresden-1. Planned power facilities in Illinois are listed. (Houser-ORNL) W74-08646

STATE ENVIRONMENTAL RADIOACTIVITY SURVEILLANCE PROGRAMS, 1972, Office of Radiation Programs, Washington, D.C.

M. A. Culliton.

Available from Supt. of Documents, U.S. Govt. Printing Office, Washington, D.C., \$0.50 per copy. Radiation Data and Reports, Vol 14, No 3, p 145-173. March 1973. 1 tab

Descriptors: *Radioactivity, *Survey, *State government, *Regulation, *Public health, Monitoring, Assay, Data collections, Air pollution, toring, Assay, Data concertoris, An pointation, Water pollution, Water pollution sources, Soil contamination, Sampling, Analytical techniques, Radioisotopes, Fallout, Food chains. Identifiers: *Surveillance program.

A summary is presented of state environmental radioactivity surveillance programs for 1972. Information is given in table form on sample media, sites, collection and analysis frequency, and types of analysis performed. Data from this program made available to the Office of Radiation Programs, Environmental Protection Agency will be included in the National Environmental Radiation Data System now being designed and developed. This system will serve as a central source of environmental radiation data. (Houser-ORNL) W74-08647

SUMMARY OF ENVIRONMENTAL MONITOR-

ING AT PHILADELPHIA, 1958-1971, Philadelphia Public Health Dept., Pa. Div. of Occupational and Radiological Health.

J. E. Lieberman, R. D. Ice, M. Green, and R. McGrattan

Available from U.S. Supt. of Documents, Washington, D.C., \$1.00 per copy. Radiation Data and Reports, Vol 14, No 6, p 333-350, June 1973. 2

Descriptors: *Monitoring, *Assay, *Radioactivity, *Fallout, *Pennsylvania, Data collections, En-vironment, Measurement, Evaluation, Toxicity, Public health, Regulation, Governments, Analytical techniques, Ships, Water pollution, Water pollution sources, Submarines, Military aspects, Nuclear powerplants, Nuclear explosions. Identifiers: *Philadelphia, *Delaware Valley.

The City of Philadelphia maintains an environmenthe environment of the Delaware Valley. The program has evolved from the initial goals of setting operational guides for the collection and analyses of data at sites of nuclear ship operations, through preoperational radiological data collection associated with the construction of the N.S. Savan-

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nah, through a nuclear weapons fallout evaluation, to the present objective of providing environmen-tal surveillance of nuclear facilities. A 13-year compilation of environmental data from the City is results of raw and finished surface waters, gross beta results of air samples, and strontium-90 and iodine-131 quantities in pasteurized milk. (Houser-ORNI) W74-08648

TRITIUM BURDENS IN TWO ARCTIC VIL-

LAGES, National Environmental Research Center, Las

Vegas, Nev. J. A. Eckert, and R. B. Evans.

Journal available from Supt. of Documents, U.S. Govt. Printing Office, Washington, D.C., \$1.00 per copy. Radiation Data and Reports, Vol 14, No 5, p 273-275, May 1973. 3 %; 2 tab, 6 ref.

Descriptors: *Environment, *Monitoring, *Radioactivity, *Cesium, *Tritium, *Alaska, Arctic, Domestic water, Public health, Water pollu-*Monitoring, tion, Urine, Analytical techniques, Data collec-

Identifiers: Body burden.

During a routine visit to measure cesium-137 body burdens in residents of two Alaskan villages, drinking water and urine samples were collected and analyzed for tritium. The mean concentrations at Noatak, Alaska, were 1200 pCi/liter and 1500 pCi/liter for tritium in drinking water and urine. respectively. At Kiana, the mean tritium concentration in drinking water was less than 400 pCi/liter, and the mean tritium concentration in urine was 1000 pCi/liter. (Houser-ORNL) W74-08649

TRITIUM SURVEILLANCE SYSTEM, OC-

TOBER-DECEMBER 1972.
Office of Radiation Programs, Las Vegas, Nev.
Radiation Data and Reports, Vol 14, No 5, p 294-297, May 1973. 4 p, 2 fig, 3 tab, 6 ref.

Descriptors: *Pollutant identification, Pollutants, Water pollution, *Water pollution sources, Water quality, Domestic water, *Potable water, *Tritium, *United States.

The Tritium Surveillance System is an expansion of previous tritium surveillance activities initiated by the Public Health Service and transferred in 1970 to the Office of Radiation Programs of the Environmental Protection Agency. Most of the activity in the past involved levels in surface water. The present network includes drinking water and precipitation sampling as well. This article in-cludes the locations of the samplings, tables of data including locations, collection dates, and con-centrations. (Wadley-Florida) W74-08650

SURVEILLANCE PROGRAMS. NOVEMBER 1972.

National Environmental Research Center, Las Vegas, Nev.

ation Data and Reports, Vol 14, No 5, p 290-293, May 1973. 4 p, 2 fig, 1 tab.

Descriptors: *Pollutant identification, *Water pollution sources, Surface waters, Potable water,

*Water surveillance network, Identifiers: Radionuclide concentrations.

The Water Surveillance Network is operated by the National Environmental Research Center-Las Vegas and consists of 90 sampling locations situated in the area surrounding the Nevada test site and is operated in support of the nuclear testing programs sponsored by the U.S. Atomic Energy Commission and the Space Nuclear Systems, Office of the National Aeronautical and Space Administration. The sampling is conducted to determine radionuclide concentrations and to take protective action if required. For surface water samples, the analyses include strontium-89, strontium-90, plutonium-238, plutonium-239, uranium, and radium-226. For drinking water, the analyses include strontium-89, strontium-90, uranium, and radium-226. The results of all tests are listed. No gamma-emitting fission products were identified in any of the samples. (Wadley-Florida) W74-08651

SURVEILLANCE WATER PROGRAMS, PERDITADY 1973 AND 1972, SPECIAL ANALYSES.

National Environmental Research Center, Las Vegas, Nev.

Radiation Data and Reports, Vol 14, No 8, p 482-490, August 1973. 9 p, 2 map, 2 tab.

Descriptors: Water resources, *Surface water, *Radiochemical analysis, *Radioactivity, *Fallout, Water supply, Technology, Chemical properties, Nuclear powerplants, Test procedures, Radioisotopes, Analytical techniques, Gammarays, Laboratory tests, *Nevada.

The Water Surveillance Network is operated by the National Environmental Research Center-Las Vegas, in support of the nuclear testing programs sponsored by the Atomic Energy Commission (AEC) at the Nevada Test Site (NTS). In the event of a release of radioactivity, special sampling within the affected areas is conducted to determine radionuclide concentrations. Selected samples from each of 61 sampling locations are given special analyses at least once a year for the pur-pose of identifying the source of the gross radioactivity in all network samples and comparing them with both the AEC concentration guides and the PHS Drinking Water Standards. These special analyses include strontium-89 and -90, plutonium-238 and -239, uranium and radium-226. Analytical results of all water samples collected during 1972 are set forth. (Sutton-Florida) W74-08652

RADIOACTIVITY IN WASHINGTON SURFACE WATER JULY 1970-JUNE 1971.

Washington State Dept. of Social and Health Services, Olympia.

Radiation Data and Reports, Vol 14, No 8, p 494-497, August 1973. 4 p, 5 fig, 3 tab, 1 map, 4 ref.

Descriptors: *Water supply, *Radiochemical analysis, *Water sources, *Radioactivity, *Surface water, *Washington, Technology, Air pollution ef-fects, Fallout, Water resources, Gamma rays, Radioisotopes, Laboratory tests, Test procedures, Applytical techniques Analytical techniques.

Testing surface water samples to determine radioactive content is a prime function of the Washington State Department of Ecology as part of a continuing radiation surveillance program. Samples are collected at different intervals from various rivers in the State in 2-liter polyethylene bottles by grab sampling and are mailed to the State radiation laboratory and special analyses are performed by the National Environmental Research Center in Las Vegas. The article describes the analytical procedures used in detecting gamma-ray emitters and samples from the Columbia River are also analyzed for phosphorus-32, a pure-beta particle emitter not detectable in the gamma-ray scan. Each method is detailed, outlining the materials used and the holding periods after collection. Monthly averages of monitoring data are plotted and reasons are set forth concern-ing the dropping of radioactivity concentrations in the Columbia River. The various tables, figures, and maps made understanding of the study relatively simple. (Sutton-Florida) W74-08653

RADIOACTIVITY IN NEW YORK STATE SUR. FACE WATER, JULY-DECEMBER 1971.

New York State Dept. of Environmental Conservation, Albany. Bureau of Radiological Pollution

Radiation Data and Reports, Vol 14, No 8, p 491-493, August 1973. 3 p, 1 map, 3 tab, 2 ref.

Descriptors: *Public health, *Radiochemical analysis, *Water supply, *Surface water, *Water resources, *New York, Radioactivity, Fallout, Nuclear powerplants, Water sources, Laboratory tests, Analytical techniques, Gamma rays, Technology, Chemical properties, Water quality, Nuclear wastes

In 1955, the New York State Department of Health began a program to determine the amount of radioactivity in water used for public consumption. The analytical procedures employed by the State Radiological Sciences Laboratory are described in a simple, fairly untechnical manner, although many chemical names are used. A gross beta determination is the first method, followed by other tests for various compounds including strontium, alkaline, and iron earths. Tritium in water is determined by liquid scintillation counting and minimum sensitivities are 1,000 pCi/liter for the Tri-Carb and 500 pCi/liter for the Beckman. Discussion is then presented on the frequency of sampling and the results are shown in the various tables and figures, which can prove very informa-tive. (Sutton-Florida) W74-08654

WATER SURVEILLANCE PROGRAMS, APRIL-

National Environmental Research Center, Las Vegas, Nev.

Radiation Data and Reports, Vol 14, No 9, p 605-609, October 1973. 5 p, 2 map, 2 tab.

Descriptors: *Radiochemical analysis, *Water supply, "Surface water, "Water resources, Radioactivity, "Nevada, Technology, Gammarays, Chemical properties, Fallout, Laboratory tests, Analytical techniques, Nuclear powerplants, Radioisotopes, Test procedures.

Consisting of 61 sampling locations, the Water Surveillance Network, in the off-site area surrounding the Nevada Test Site(NTS) is operated in support of the nuclear testing programs conducted by the Atomic Energy Commission (AEC). In the event of a release from the NTS, specific sampling within the affected area is conducted to determine radionuclide concentrations. Other sampling stations are set up when requested in other areas. For a complete description of sampling and routine analytical procedures used, a cross-reference is given to the July 1973 issue of Radiation Data and Reports. The routine analytical results of all water samples collected between April and May 1973 are listed in two tables and it should be noted that no gamma-emitting fission products were identified by gamma spectrometry in any of the April and May samples. The calendar year analytical results will be fully reported at a later date. (Sutton-W74-08655

TRITIUM SURVEILLANCE SYSTEM, APRIL-

National Environmental Research Center, Las Vegas, Nev. diation Data and Reports, Vol 14, No 10, p 601-604, October 1973. 4 p, 2 map, 3 tab.

Descriptors: *United States, *Tritium, *On-site data collections, *Rivers, *Nuclear wastes, Nuclear power plants, Water pollution sources, Water quality control, Data collections, Data processing, Instrumentation, Maps, Statistics, Water law, Water policy, Water pollution, Networks, Regional analysis.

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The Tritium Surveillance System network was established to measure and monitor tritium concentrations in major river systems in the United States. It also provides surveillance at surface water stations downstream from selected nuclear facilities. Other sampling services were established but all have since been incorporated into one overall system. Drinking water and precipitation samples have been collected and analyzed. Maps are included citing the sampling locations chosen by the system. From these locations, samples were taken and analyzed. Tables have been compiled to present tritium concentra-tions in drinking water, in surface water samples, and in precipitation samples for a specific period of time. (Procter-Florida) W74-08656

SALT-WATER INTRUSION AND ITS CON-TROL.

California Univ., Berkeley. Dept. of Civil Engineering

Journal of the American Water Works Association, Vol 66, No 3, p 180-187, March 1974. 16 fig,

Descriptors: *Saline water intrusion, *Water pollution control, Saline water barriers, Artificial recharge, Water spreading, Withdrawal, Injection

Saltwater intrusion is a natural and troublesome phenomenon that renders groundwater unpotable. It must therefore be controlled or eliminated where possible. Various means of preventing saltwater from contaminating groundwater sources of drinking water are discussed. The states of California, Texas, Florida, New York(Long Island), and Hawaii have been affected to the largest extent. At least six methods have been proposed to control intrusion: Controlling pumping patterns--requires that the pumping draft be altered sufficiently by reduction in extractions or by rearrangement of areal pattern of pumping so that groundwater levels will rise. Direct artificial sur-face recharge--requires that groundwater levels be raised and maintained by artificial recharge, using surface spreading for unconfined aquifers and recharge wells for confined aquifers. Maintenance of a freshwater ridge-requires maintenance of a freshwater ridge in the aquifer along the coast by surface spreading for unconfined aquifers or by recharge wells for confined aquifers. Development of an extraction barrier--requires maintaining a continuous pumping trough by a line of wells adjacent to the ocean. Seawater would move inland from the ocean to the trough, and freshwater in the basin would move seaward toward the trough. A combination injection ridge and pumping trough can be formed. Both extraction and recharge rates would be somewhat reduced over those required using only a single method; however, the number of wells required would be basically doubled. Impermeable subsurface barriers--involve establishment of a subsurface barrier to reduce the permeability of the aquifer sufficiently to prevent the inflow of seawater into the basin. Construction of a barrier could be achieved using sheet piling, pudded clay, emulsified asphalt, cement grout, bentonite, silica gel, calcium acrylate, or plastics. (Knapp-USGS) W74-08662

AIR-BORNE ACID.

Swedish Water and Air Pollution Research Lab., Goteborg. For primary bibliographic entry see Field 5A. W74-08689

RESIDENCE TIME OF SULFUROUS AIR POL-LUTANTS FROM A LOCAL SOURCE DURING PRECIPITATION.

Uppsala Univ. (Sweden). Dept. of Meteorology. For primary bibliographic entry see Field 5A. W74-08690

DETERMINATION OF THE ACTIVITY OF NITRIFYING BACTERIA IN SURFACE WATERS BY A MODIFIED BOD-TEST, (IN GERMAN).

Hamburgisches Hygienisches Institut (West Ger-

K. Roch, and A. Kaffka.

Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. Vol 156, No 4/5, p 414-421, 1972. Illus. English summary.

Identifiers: Bacteria, Biological studies, Estuary, *Nitrifying bacteria, Oxygen, Rivers, Seasonal, *West Germany(Elbe River), *Biochemical oxvgen demand test

A modified method of the BOD (biochemical O2 demand) test was applied in order to find out the seasonal alterations of Nitrifying bacteria in surface waters. In studies of the Elbe River (W. Germany), the samples collected at Teufelsbrueck (km 630.1) were diluted 1:10 with aerated tap water and mixed with 5.2 mg/1 NH4 plus or minus nitrogen (0.37 x 10 minus 3 M/1). As the result of this admixture a seasonal increase of BOD was found. This increase was caused by the activity and number of the NH4 plus or minus oxidizing bacteria and depended on temperature. The low NH4 plus or minus content functioning in summer as a limiting factor does not allow a higher in-fluence of nitrification on the BOD and O2 balance in the receiving water. With regard to water hygiene the nitrifying flora can affect the O2 balance significantly, particularly in rivers of long reten-tion time or in estuaries loaded by nitrogenous waste waters during the summer time or if the river water is artificially heated by cooling water discharge .-- Copyright 1973, Biological Abstracts, Inc. W74-08694

THE SHARE TAKEN BY NITRIFICATION PROCESSES IN THE BIOCHEMICAL OXYGEN DEMAND (BOD) IN THE WATER OF THE RIVER ELBE, (IN GERMAN),

Hamburgisches Hygienisches Institut (West Ger-For primary bibliographic entry see Field 5A.

W74-08695

NATURAL NIDI OF CUTANEOUS LEISH-MANIASIS IN THE ZONE OF THE KARA KUM CANAL (4TH STAGE) AND THEIR EPIDEMIC SIGNIFICANCE, (IN RUSSIAN), Akademiya Nauk Turkmenskoi SSR, Ashkhabad.

Institut Zoologii i Parazitologii.

T. N. Remy Annikova. Zdravookhr Turkm. Vol 15, No 11, p 30-33, 1971. Identifiers: Canals, *Cutaneous leishmania, Epidemic studies, Human diseases, Phlebotomus-Spp, *USSR(Turkman).

The territory through which passes the route of the fourth stage of the Kara Kum canal and its Kizyl-Atrek branch (USSR) is dissimilar with respect to the character of the natural nidi of cutaneous leishmaniasis and presents a different hazard from the viewpoint of the possibility of epidemic outbreaks of the disease. The following species were discovered: Phlebotmus paptasi, Ph. caucasicus, Ph. andrejivi, Ph. mongolensis, Ph. sergenti, Ph. chininsis, Sergentomylia grecovi, S. arpaklensis and S. pawlowshyi.—Copyright 1973, Biological Abstracts, Inc.

CERTAIN PROBLEMS OF THE SANITARY STATE OF UPPER REACHES OF THE SARATOV WATER RESERVOIR, (IN RUS-SIAN), Kuybyshev Res. Hyg. Inst. (USSR).

Kuyoysiev Res. Hyg. IIIst. (OSSR). S. N. Bukovskaya, and I. F. Sukhacheva. Gig Sanit. Vol 36, No 11, p 106-107, 1971. Identifiers: Reservoirs, *Sanitary conditions, *USSR(Saratov reservoir), Water pollution, Flow.

The problem of water pollution of the Saratov water reservoir is that there is a sharp difference in flow on workdays and holidays. Water flow on Sundays and holidays drops to 1000 m3/sec. Since the calculations of water pollution preventive methods were based on a minimal flow of 3000 malsec, guaranteed sanitary discharge from the factory biological purification station of V.I. Lenina is necessary.--Copyright 1973, Biological Abstract, Inc. W74-08698

5C. Effects Of Pollution

APPLICATIONS OF GROWTH AND SORPTION

APPLICATIONS OF GROWTH AND SORT HON ALGAL ASSAYS, Wisconsin Univ., Madison. G. P. Fitzgerald, and P. D. Uttormark. Copy Available from GPO Sup Doc as EPI.23:660/3-73-023, \$2.10; microfiche from NTIS as PB-232 446, \$1.45. Environmental Protection Agency Ecological Research Series Report EPA-660/3-73-023, February 1974. 186 p, 64 fig, 43 tab, 48 ref. EPA Program Element 1BA031. R-801361.

*Analytical techniques, Aquatic plants, "Sorption, Phosphorus compounds, Rooted aquatic plants, Bioassay, Competition, Eutrophication, Muds, Anaerobic conditions, Nitrogen, Iron, Chemical analysis, Nutrients, Limiting factors, "Wisconsin. Identifiers: *Madison lakes(Wis).

The availability and utilization of nutrients by algae and rooted aquatic plants was measured in laboratory studies using both sorption and algal growth assays. The tests were conducted to evaluate contributions of phosphorus to the Madison (Wisconsin) lakes from septic tanks, agricultural runoff, and urban drainage and to measure changes in the nutritional status of six lakes which were manipulated for water quality improvement by nutrient inactivation or hypolimnetic aeration. The assay techniques are described and results are compared with chemical determinations of plant nutrients. Comparative rates of phosphorus sorpnutrients. Comparative rates of phosphorus sorp-tion by different types of aquatic plants were determined by three methods in order to un-derstand how the plants compete for limited phosphorus sources. In situ and laboratory experi-ments indicated that naturally layered lake muds in three lakes release soluble phosphate-phosphorus when disturbed and will be competitively sorbed by both muds and plants in aerobic conditions. Studies with duckweed, Lemna minor, showed that it cannot utilize the phosphorus of aerobic lake muds but can absorb phosphorus from lake muds when its roots are able to penetrate presumably anaerobic areas. Comparisons have demonstrated that ground waters and some storm sewer discharges contain phosphorus compounds that are not available to algae. (Uttormark-Wisconsin) W74-08154

PROCEEDINGS: FIRST WETLANDS CON-FERENCE, JUNE 20, 1973,
Connecticut Univ., Storrs. Inst. of Water

Resources. For primary bibliographic entry see Field 2L. W74-08157

NEUROLOGICAL CHANGES IN CATS FOL-LOWING LONG-TERM DIET OF MERCURY CONTAMINATED TUNA, Wisconsin Univ., Madison, Dept. of Pathology. L. W. Chang, S. Yamaguchi, and A. W. Dudley, Jr. Acta Neuropathologica (Berlin), Vol 27, No 2, p 171-176, 1974. 4 fig, 30 ref.

Descriptors: *Mercury, *Toxicity, *Public health, *Animal pathology, *Tuna, Human diseases, Investigations, Reviews.
Identifiers: *Neurological disturbances(Cats),

Fish contamination

Effects Of Pollution—Group 5C

Kittens of both sexes were fed daily with mercury contaminated tuna containing about 0.5 ppm mer-cury. Neurological disturbances similar to those in Minamata disease or in experimental mercury in-toxication were observed after 7-11 months. Microscopic examination revealed degenerations of the granular layer and some Purkinje neurons in the cerebellum. Neuronal necrosis was also observed in the cerebral cortex. This investigation suggests that fish containing 0.5 ppm mercury may still be potentially hazardous to health when consumed in excessive amounts for prolonged periods of time. (Sandoski-FIRL) W74-08200

A BIOASSAY OF TOXICITY USING PRUTOZOA IN THE STUDY OF AQUATIC ENVIRONMENT POLLUTION AND ITS PREVEN-

Institutul de Medicina si Farmacia, Iasi (Rumania). Catedra de Igiena. For primary bibliographic entry see Field 5A.

W74-08221

THE SURPRISE FACTOR IN MARINE POLLU-

TION STUDIES, Scripps Institution of Oceanography, La Jolla,

For primary bibliographic entry see Field 5B. W74-08252

ENVIRONMENTAL EFFECT OF A COMPLEX NUCLEAR FACILITY, DuPont de Nemours (E.I.) and Co., Aiken, S.C.

For primary bibliographic entry see Field 5D. W74-08254

SALINITY-OZONE INTERACTIONS ON PINTO BEAN: INTEGRATED RESPONSE TO OZONE CONCENTRATION AND DURATION, Agricultural Research Service, Riverside, Calif.

Salinity Lab. For primary bibliographic entry see Field 3C. W74-08330

THE ACCUMULATION OF ORGANIC AND IN-ORGANIC MERCURY COMPOUNDS BY THE EASTERN OYSTER (CRASSOSTREA VIR-GINICA),

Environmental Protection Agency, Dauphin Island, Ala. Gulf Coast Water Supply Research,

Lab. F. C. Kopfler. Bulletin of Environmental Contamination and Toxicology, Vol 11, No 3, p 275-280, March, 1974. 1 fig, 3 tab, 10 ref.

Descriptors: *Mercury, *Oysters, *Laboratory tests, United States, Coasts, Pollutants, Fish physiology, *Absorption, Water pollution effects. Identifiers: Mercury uptake.

The presence of mercury contamination in some coastal waters of the United States prompted an investigation into the extent of concentration of investigation into the extent of concentration of various mercury compounds by shellfish in those coastal waters. This study was designed to investigate the differences in mercury uptake when oysters were exposed to specific environmental levels of inorganic, phenyl- and methyl-mercury compounds. Experimental results indicate that oysters, following continuous exposure to even necessary filter than the content of the conte one microgram/liter mercury in any of the three compounds studied, rapidly concentrated mercury in their tissues far in excess of the 0.5 ppm guideline established by the Food and Drug Ad-ministration. (Sandoski-FIRL)

RESIDUES OF MIREX AND OTHER CHLORINATED PESTICIDES IN COMMERCIALLY RAISED CATFISH,
J. C. Hawthorne, J. H. Ford, and G. P. Markin.

Bulletin of Environmental Contamination and Toxicology, Vol 11, No 3, p 258-264, March, 1974. 1 fig, 3 tab, 5 ref.

Descriptors: *Catfishes, *Mississippi, *Arkansas, *Insecticides, Food chains, Fish physiology, *Clorinated hydrocarbon pesticides, *Pesticide Identifiers: *Mirex.

Commercially raised catfish from parts of Mississippi and southern Arkansas in which the insecti-cide mirex was used extensively for the control of the fire ant have been sampled and analyzed. Mirex was found in none of the 50 samples at the detection level, 0.01 ppm; however, all samples contained extensive residues of other pesticides. The lack of detectable mirex residues indicates that there is no widespread contamination of the catfish and that mirex is probably one of the least of the chlorinated pesticides to reach humans by consumption of catfish. (Sandoski-FIRL) W74-08347

CADMIUM UPTAKE AND TIME DEPENDENT ALTERATIONS IN TISSUE LEVELS IN THE WHITE CATFISH ICTALURUS CATUS (PISCES: ICTALURIDAE),

State Univ. of New York, Buffalo. Dept. of Biochemistry.

D.W. Rowe, and E. J. Massaro. Bulletin of Environmental Contamination and Toxicology, Vol 11, No 3, p 244-249, March, 1974. 1 tab, 18 ref.

Descriptors: *Cadmium, *Catfishes, *Laboratory tests, Fish physiology, Water pollution effects, Toxicity, *Absorption.

Identifiers: Time dependent distribution.

Anatomical differences, compared to centrarchid and salmonid fishes, coupled with the commercial and sport-fishing importance of catfish prompted this investigation of the time dependent distribution of cadmium in white catfish. Fish were found to regurgitate from 39 to 56 percent of the dose solution within the first hour. After one hour, 75.1 percent of the Cd body load was contained within the gastrointestinal tract; maximum relative con-centrations were attained by the stomach, esophagus, and skin within one hour. The intestinal portions attained maximum levels at widely divergent times. Outside the GI tract, the liver and kidney contained the highest percentages of the body load at 21 days (termination of experiment); these organs may not have reached their relative maximum concentrations at this time. (Sandoski-FIRL) W74-08348

THE USE OF THE DILUTION WATER EFFECT AS A WATER QUALITY CRITERION, AS A WALER QUALITY CRITERION, Southeastern Massachusetts Univ., North Dart-mouth, Dept. of Biology. For primary bibliographic entry see Field 5A. W74-08356

THE TOXICITY OF SULPHATE PULP BLEACHING EFFLUENTS, Finnish Pulp and Paper Research Inst., Helsinki.

O. Seppovaara. Paperi ja Puu (Papper och Tra), Vol 55, No 10, p 713-715, 717-720, Oct. 1973. 5 fig, 2 tab, 8 ref.

Descriptors: *Pulp wastes, *Waste dilution, *Bleaching wastes, *Toxicity, Fish, *Aquatic or-Bleaching wastes, "Toxicity, Fish, "Aquatic or-ganisms, Aquatic life, Water pollution sources, "Water pollution effects, "Trout, "Carp, Rainbow trout, Oxygen, Chlorine, Industrial wastes, Effluents, Pulp and paper industry, Lethal limit, Fish physiology, Fish behavior, Waste water(Pollution).

Identifiers: Crucian carp, Bleach plants, Kraft mills, Chlorine dioxide, Hypochlorites, Sublethal

The long-term consequences of water pollution by kraft pulp bleaching effluents for aquatic organisms were investigated. Rainbow trout (Salmo gairdneri) and crucian carp (Carassius carassius) were exposed to waste waters from oxygen-alkali bleaching, four-stage CEHH pine pulp bleaching, and six-stage CEHDED birch pulp bleaching. (C = chlorine, E = alkaline extraction, H = hypochlorite, D = chlorine dioxide). As measured by the standard toxicity test of the American Public Health Association, the fish survived all effluents in 1:10 to 1:25 dilutions, except for chlorination-stage effluents which killed trout even at 1:150 dilution when the active chlorine content was 0.5 mg/liter. Mixing with other effluents considerably reduced the toxicity of chlorination wastes. Long-term exposure caused health disturbances, such as abnormal behavior, deterioration of blood characteristics, and minor injuries to internal organs. In view of the presence of harmful effluents from other than papermaking sources, and because of the low tolerance of natural waterways to poisons and acids, a 500-fold dilution may be necessary to avoid toxic effects from bleached kraft mill outfalls in fish populations. (Brown-IPC) W74-08403

CELLULOSIC DEPOSITS IN BENTHAL EN-VIRONMENTS: OCCURRENCE, EVOLUTION, AND DECOMPOSITION,

Institute of Paper Chemistry, Appleton, Wis. For primary bibliographic entry see Field 5B. W74-08423

CHANGES IN THE HETEROTROPHIC BAC-TERIA OF VOLTA LAKE, 1968-1971, Ghana Univ., Legon. Volta Basin Research Pro-

Ghana J Sci. Vol 12, No 1, p 72-85, 1972. Illus. Identifiers: *Bacteria(Heterotrophic), *Coliforms, Ghana(Volta Lake), Lakes, Seasons, Temperature, Water pollution effects.

A previous study of the heterotrophic bacteria of Volta Lake was continued over the final stages of its formation. A regular sampling program was maintained at Ajena and supplemented by occasional samples from stations up-lake. Temperature and Secchi disk transparency increased and seasonal differences decreased. Bacteria appeared unaffected by changes in temperature while there was evidence of an inverse relationship with transparency in the surface layers. Throughout the period highest counts came from below 20 m. Two or 3 peaks occurred each year, the main one coinciding with the early rains. The difference in counts from near the shore and from the mid-lake was greatest during the early rains and also during the subsequent floods. Gram-negative rods continued to predominate. Gram-positive spore forming rods were mainly found on the bottom and their general distribution was very variable. Chromogens accounted for about 1/5 of the population. Presumptive coliform organisms decreased steadily until 1970 and then rose abruptly but without evidence of fecal pollution.—Copyright 1973, Biological Abstracts, Inc.

INDICATIONS OF THE RELATIONSHIP BETWEEN PHYTO-PLANKTON TION AND PHOSPHATE LEVELS, DISTRIBU-

Singapore Primary Production Dept. Foo Yen Chen, and A. Shirota.

In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 242-250, 1972: I fig. 4 tab, 7 ref.

Group 5C-Effects Of Pollution

Descriptors: *Phosphates, *Eutrophication, *Reservoirs, Algae, *Phytoplankton, Water pollution effects, Nutrients, Water quality, Fertilizers. Identifiers: *Singapore.

Preliminary findings on phosphate values and phytoplankton distribution in streams and reservoirs in Singapore are discussed. Water samples were collected at various depths from Seletar Reservoir (280 ha), Peirce Reservoir (110 ha) and MacRitchie Reservoir (102 ha). A total of 11 sta-tions were sampled in Seletar Reservoir and 4 each in Peirce and MacRitchie Reservoirs. The phosphate values (expressed as elemental P) at various depths in MacRitchie Reservoir range from 0.26 microgram-atom/liter to 0.78 microgramatom/liter; those of Peirce Reservoir from 0.05 to 0.50 microgram-atom/liter and those of Seletar Reservoir from 0.31 to 1.46 microgram-atom/liter. The phosphate levels of Seletar Reservoir have given rise to an algal population commonly found in highly eutrophic waters, consisting predominantly of Dictyosphaerium, Scenedesmus, Coelasrtum (Chlorophyta), Microcystis, Oscillatoria, Phormidium, Aphanocapsa and Merismopedia (Cyanophyta). (See also W74-08454) (Knapp-USGS) W74-08476

DEVELOPMENT OF BLUE-GREEN ALGAL BLOOMS IN NON-ALKALINE WATERS, Singapore Univ. Dept. of Zoology.

D. S. Johnson.

In: Water Resources, Environment and National Development—Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 256-267, 1972 A fig. 49 ref 1972. 4 fig, 49 ref.

Descriptors: *Eutrophication, *Tropical regions, Alkalinity, Phosphates, Carbonates, Fertilizers, Algae, Nutrients, Primary productivity, Water pollution effects, *Cyanoplita.

Identifiers: *Singapore.

Blue-green algal blooms in reservoirs in Malaysia and incipient blooms in Singapore reservoirs are unexpected since the majority of these habitats are calcium-poor, low alkalinity, low pH habitats which are generally low in dissolved minerals. The development of blue-green blooms was studied in an acid water pond. The pond is extremely calci-um-poor (3.0 - 4.5 parts per million). At the start of the survey, the midday pH varied from 6.3 to 7.0 with still lower levels at night; the alkalinity ranged from 0.14 to 0.29 meq/liter and the phytoplankton were a diversified soft-water assemblage dominated by green algae and with an abundance of desmids. Slight fertilization was sufficient to initiate a spectacular blue-green bloom which finally rose to over \$1,000 organisms per liter. Blue-green blooms develop much more readily in equatorial climates than in temperate climates. They are like-ly to develop in waters in which they would not occur in temperate areas, at relatively low levels of fertilization, and at any period of the year, where there is no long-continued dull weather. Thus more stringent control is necessary to avoid eutrophication than would be required in temperate areas. (See also W74-08454) (Knapp-USGS) W74-08478

TOXICITY CONTROL OF INDUSTRIAL WASTEWATERS AND PESTICIDE-POLLUTED

WATERS IN VIETNAM, Institut Pasteur du Vietnam, Saigon. Dept. of Water Sanitation and Toxicology. The Tran Phan, and Thi Thuan Bich Do.

In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 272-276, 1972. 9 tab, 5 ref. Descriptors: *Toxicity, *Bioassay, *Water pollution control, *Monitoring, Fish, Carp, Fishkill. Identifiers: *Vietnam, Goldfish.

A bioassay evaluating the acute toxicity to Carassius auratus (goldfish) is used to test the toxicity of industrial wastewaters and pesticide-polluted waters in Vietnam. The wastewaters coming from hydrochloric acid and alkali manufacturing plants (no 24 hr TLm) are found usually less toxic than those coming from galvanized sheet-metal manu-facturing plants (24 hr TLm = 50%) or from textile dyeing plants (24 hr TLm = 36%). These results fit quite well with BOD values determined for these same waters. The toxicity of waters from Xuan than in December (48 hr TLm = 30%). the height of the rainy season comes in July (rainfall: 205mm), while December (rainfall: 28 mm) is a dry month. Precipitation washes away the pesticides sprayed on the vegetable crops grown on the slopes surrounding Xuan Huong Lake and makes these waters more toxic in the rainy season. (See also W74-08454) (Knapp-USGS) W74-08480

CHEMICAL COMPOSITION AND MOLECU-LAR WEIGHT DISTRIBUTION OF DISSOLVED ORGANIC MATTER PRODUCED BY BACTERI-

AL DEGRADATION OF GREEN ALGAE, Dep. Chem., Tokyo Metrop. Univ., Setagaya, Tokyo Jap. Tokyo Metropolitan Univ. (Japan). Dept. of Chemistry.

T. Akiyama.

Geochem J. Vol 6, No 2, p 93-104, 1972. Illus. Identifiers: Algae, Carbohydrates, Chemical com-position, *Chlorella, Chlorophyll, position, *Chlorella, *Degradation(Bacterial), Dissolved solids, Dis-**ibution patterns, *Japan(Lake Haruma), tribution patterns, *Japan(Lake Haruma), *Molecular weight, Organic matter, Pigment, Produced, Protein, *Chlorophyta.

Chemical composition and molecular weight of dissolved organic matter were determined by employing chemical analysis and Sephadex Gel filtration method with respect to bacterial (from water of Lake Haruna, Japan) degradation products of green algae (Chlorella). The chemical composition is as follows: pigment materials 15%, lipid and organic acid materials 30%, proteinous materials 26% and carbohydrate materials 8%. The molecular weight of the dissolved organic matter is dislar weight of the dissolved organic matter is un-tributed in wide ranges. Organic matter with high molecular weight (>50,000) consists mainly or proteinous and carbohydrate materials; inter-mediate one (1500-50,000) consists of pigment and lipid materials. The composition of lower molecu-lar weight matter is not yet known. The dissolved organic matter produced by bacterial degradation of green algal cells is characterized by vellow coloring, which orginates in pigments (in main chlorophyll pigments), and high molecular weight organic substances, which consist almost of proteinous substances with lesser amounts of carbohydrate substances. Although there is a considerable difference between the dissolved organic matter of bacterial degradation products and that in natural water, the former is suggested to be an important source of the latter.--Copyright 1973, Biological Abstracts, Inc. W74-08494

CHANGES OF THE NUMBER OF BACTERIAL CHANGES OF THE NUMBER OF BACTERIAL CELLS OF DIFFERENT MORPHOLOGICAL GROUPS IN THE WATER AND BOTTOM DEPOSITS OF THE KHAKON RESERVOIR AS FUNCTION OF THE INTENSITY OF DEVELOPMENT OF BLUE-GREEN ALGAE, (IN UKRAINIAN),

N. I. Sakharova, and L. H. Brantsevych. Visnik Kyyiv Univ Ser Biol 14 p 88-89, 1972. English summary.

Identifiers: Algae, *Bacterial cells, *Bottom deposits, Reservoirs, *USSR(Kharkov reservoir), Water pollution effects, *Cyanophyta, Morphology. Distribution patterns.

The vertical, horizontal and season distribution of bacteria of different morphological groups in the water and bottom deposits of the Khakov reservoir (USSR) was studied. Bacilli, mainly nonsporeforming, predominated. Along with other factors, the number of blue-green algae and especially their physiological condition had a substantial effect on the content of bacteria in the water and deposits of the reservoir .-- Copyright 1973, Biological Abstracts, Inc. W74-08505

ADVERSE EFFECTS OF COAL MINING ON FEDERAL RESERVOIR PROJECTS. For primary bibliographic entry see Field 5G. W74-08528

OUR GREAT LAKES.

Wisconsin Univ., Madison. Sea Grant College Pro-For primary bibliographic entry see Field 2H. W74-08531

ENVIRONMENTAL HAZARDS OF LARGE-SCALE DEVELOPMENTS, Geological Survey, Raleigh, N.C. For primary bibliographic entry see Field 6G. W74-08601

RICHARDSON BAY EFFLUENT DILUTION STUDY--A WORKING PAPER. Environmental Protection Agency, San Francisco, Calif. Region IX For primary bibliographic entry see Field 5B. W74-08604

THE MICROBIAL DEGRADATION OF OIL POLLUTANTS, Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5B.
W74-08609

HYDROCARBON UTILIZATION RV CLADOSPORIUM RESINAE. Dayton Univ., Ohio. Dept. of Biology. For primary bibliographic entry see Field 5B. W74-08613

MICROBIAL DEGRADATION OF AROMATIC HYDROCARBONS, Texas Univ., Austin. Dept. of Microbiology. For primary bibliographic entry see Field 5B. W74-08614

MICROBIAL DEGRADATION OF OIL AND HYDROCARBONS IN CONTINUOUS CUL-TURE. State Univ. Coll., Brockport, N.Y. Dept. of Biological Sciences. For primary bibliographic entry see Field 5B. W74-08615

UTILIZATION OF CRUDE OIL HYDROCARBONS BY MIXED CULTURES OF MARINE

BONS BY MIAED CULTURES OF MARIN BACTERIA, Texas Univ., Port Aransas. Marine Science Inst. For primary bibliographic entry see Field 5B. W74-08616

CONSIDERATIONS IN APPLICATION OF MICROORGANISMS TO THE ENVIRONMENT FOR DEGRADATION OF PETROLEUM PRODUCTS,
California Univ., Berkeley. Naval Biomedical Research Lab. For primary bibliographic entry see Field 5B. W74-08618

Effects Of Pollution—Group 5C

MICROBES AND PETROLEUM: PERSPEC-TIVES AND IMPLICATIONS, Georgia Univ., Athens. Dept. of Microbiology.

For primary bibliographic entry see Field 5B W74-08621

DISTRIBUTION AND ABUNDANCE OF OIL-OXIDIZING BACTERIA IN THE NORTH SEA, Biologische Anstalt Helgoland, (West Germany). For primary bibliographic entry see Field 5B. W74-08622

MARINE HYDROCARBONOCLASTIC BACTERIA: TYPES AND RANGE OF OIL TERIA: TYPES DEGRADATION.

Weapons Center, China Lake, Calif. Research Dept.
For primary bibliographic entry see Field 5B.

W74-08623

HYDROCARBON BIODEGRADATION ALASKAN WATERS,

Alaska Univ., College. Inst. of Marine Sciences. For primary bibliographic entry see Field 5B. W74-08627

MICROBIAL ECOLOGY AND THE PROBLEM OF PETROLEUM DEGRADATION IN CHES-

Maryland Univ., College Park. Dept. of Microbiology.

For primary bibliographic entry see Field 5B.
W74-08628

THE IMPACT OF OIL ON MARSHLAND MICROBIAL ECOSYSTEMS,
Louisana State Univ., Baton Rouge. Dept. of Food

S. P. Meyers, D. G. Ahearn, S. Crow, and N.

Berner.

Berner.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 221-228, 1973. 1 fig, 1 tab, 22 ref. EPA Project 800993.

Descriptors: *Oil spills, *Oil pollution, *Marshes, *Environmental effects, *Wetlands, *Pollution abatement, Ecosystems, Ecology, Food chains,

Toxicity, Grasses, 8louisiana. Identifiers: Spermatophyta, Spartina alterniflora, Microbial ecosystems, Salt-marsh estuary

The vast productivity of wetland regions along the Louisana coast, and their proximity to oil-producing sites, necessitates a more comprehensive understanding of the significance of alterations in the microbial community concurrent with oil intrusion and massive depositions of petroleum effluents. Investigations are concerned with examination of such effects on the microbial ecology and the basic food web of the Spartina marshland ecosystem. (See also W74-08609) (Sinha-OEIS)

PRODUCTION AND CHARACTERIZATION OF EMULSIFY!NG FACTORS FROM HYDROCAR-BONOCLASTIC YEAST AND BACTERIA,

Oklahoma State Univ., Stillwater. Dept. of Biochemistry. For primary bibliographic entry see Field 5B. W74-08632

SUBLETHAL EFFECTS OF THE WATER SOLUBLE COMPONENT OF OIL: CHEMICAL COMMUNICATION IN THE MARINE EN-

VIRONMENT, Oregon State Univ., Corvallis. Dept. of Zoology.

F. T. Takahashi, and J. S. Kittredge.
Proceedings of a Workshop held at Georgia State
University, December 4-6, 1972. Published by

Louisiana State University, Sea Grant Publication LSU-SG-73-01, p259,264, 1973. 1 tab. 5 ref. SG-2-35187. NSF-GB-27703. ONR-N00014-71-C-0103.

Descriptors: *Oil pollution, *Oil spills, Survival, *Reproduction, *Toxicity, *Feeding behavior, Crustacea, Crabs, Pollution, Environmental ef-

Identifiers: Chemoreceptors, Petroleum pollution, Chemoreception, Crude oils, Aromatic hydrocar-

Crude oil and petroleum products contain water soluble components that are potent inhibitors of chemoreceptors in marine organisms. Since many species rely on chemoreception for location of food and sexual partners, disruption of chemoreception in the marine environment by oil spills can have profound effects on survival and reproduction. These effects on species survival will not be revealed in the usual toxicity (LD) studies of pollutants. (See also W74-08609) (Sinha-OEIS) W74-08636

SOME ACUTE EFFECTS OF LOW-BOILING PETROLEUM FRACTIONS ON THE CELLULAR STRUCTURE OF FISH GILLS UNDER FIELD CONDITIONS,

Texas Wesleyan Coll., Fort Worth. Div. of Science

W. G. Blanton, and M. C. Robinson. Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication LSU-SG-73-01, p 265-272, 1973. 10 fig, 1 tab, 5 ref. EPA Contract 68-01-0051.

Descriptors: *Oil spills, *Oil pollution, Fishes, Environmental effects, *Water pollution effects, Enzymes, *Texas, *Louisiana, Arthropods, Path of pollutants.

Identifiers: *Cellular structure(Fish gills), Crude oils, *Fish gill damage, Hydrocarbons, Gill damage, Cell loss, Branchial filaments, Pollutant effects, East Timbalier Island(Louisiana), Aransas Bay(Texas).

Fish taken from the area of the oil slick showed gill damage in the form of cell loss. The alterations of branchial filaments may produce certain physiological malfunctions. The loss of sufficient physiological inartunctions. The loss of surficent acidophiles would reduce the production of car-bonic anhydrase-like enzyme. This enzyme defi-ciency could lead to pH changes in the blood and tissue fluids (acidosis or alkalosis) through a reduction in the rate of dissociation of carbonic acid into CO2 and hence malfunction of the bloodbuffer system. Loss of mucous cells may result in the clogging of the filaments with detritus. Resultant irritation of the filament may produce epithelial sloughing as that seen in test specimens These data are not conclusive with regard to the impact of petroleum fractions in pelagic megafauna because of the migratory nature of these animals; however, the observed damage raises certain critical questions which deserve further investigations under controlled laboratory conditions. There appears to be an inverse relationship between the amount of gill damage and the speed with which the fish in question usually swims, suggesting a direct relationship between damage and time of exposure (escape time). (See also W74-08609) (Sinha-OEIS) W74-08637

INHIBITION OF BACTERIAL CHEMORECEP-TION BY HYDROCARBONS.

Harvard Univ., Cambridge, Mass. Lab. of Applied

Microbiology. F. Walsh, and R. Mitchel.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication LSU-SG-73-01, p. 275-278, 1973. 2 tab, 6 ref. ONR N00014-67-A-0298-0026. Descriptors: Water quality control, *Microbial degradation, *Biodegradation, *Chemotaxis, Pollution effects, *Water pollution effects, Oil spills, Oil pollution, Pollutants.

Identifiers: Organic substrates, Microbial chemotaxis, *Chemoreception, Schizomycetes. Pseudomonas sp., Escherichia coli.

A wide variety of chemical and physical water pollutants is shown to inhibit microbial chemotaxis. Such chemotaxis inhibition may have direct effects on microbial predator-prey relationships or on the rate of degradation of organic substrates in the sea. The effect of a broad spectrum of hydrocarbons on bacterial chemotaxis is described. Those hydrocarbons which affect chemotaxis at concentrations found in the environment may be ecologically significant in that they may alter predator-prey interactions or the rate of biodegradation of organic substrates without affecting gross bacterial physiology. One marine bacterium, studied in detail, showed a wide variation in chemotactic response in the presence of the hydrocarbons. The effect of pollutants on chemotaxis has important short- and long-term im-plications. In the vicinity of a pollutant release, the ty. (See also W74-08609) (Sinha-OEIS) W74-08638

DEGRADATION OF CRUDE OIL BY YEASTS AND ITS EFFECTS ON LESBISTES RETICU-

Georgia State Univ., Atlanta. Dept. of Biology. W. L. Cook, J. K. Massey, and D. G. Ahearn. W. L. Cook, J. K. Massey, and D. G. Anearn. Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication LSU-SG-73-01, p 279-282, 1973. 2 tab, 6 ref. ONR N00014-77-C-0145.

Descriptors: *Oil spills, *Oil pollution, *Biodegradation, *Yeasts, Fishes, Toxicity, In-Descriptors: vertebrates, Water pollution effects. Identifiers: Guppies, *Lesbistes reticulatus, Can-

dida tropicalis, Endomycopsis lipolytica, Asphalt crudes, Crude oils, Emulsification, Pathogenicity.

Two hydrocarbonoclastic yeasts, Candida tropicalis and Endomycopsis lipolytica selected for the study of hydrocarbon-utilization activities, have been examined in combination with crude oils for their effects on the mortality of the common guppy, Lesbistes reticulatus. Water samples from tanks with yeast and crude oil were examined microscopically. In nearly every field examined. numerous amoebae, flagellates, ciliates, Daphnia and other micro-invertebrates were observed feeding on the yeasts as well as ingesting small oil globules. In aquaria with oil, but lacking yeasts, approximately one microscopic field in 50 contained invertebrates. The concentration of inver-tebrate predators in the natural environment in areas enriched with yeasts has been noted. The closed system laboratory experiments suggest that metabolites or by-products produced during yeast decomposition and emulsification of certain high asphalt crudes may be harmful to fish. In contrast, readily emulsified and generally less recalcitrant oil may have its toxicity reduced by the addition of yeasts. The extrapolation of these closed system studies to events in the open environment have not been undertaken yet. (See also W74-08609) (Sinha-OFIS) W74-08639

EFFECTS OF SOME COMMERCIAL OIL HER-DERS, DISPERSANTS AND BACTERIAL IN-OCULA ON BIODEGRADATION OF OIL IN

SEAWATER, Rutgers-The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology. R. M. Atlas, and R. Bartha.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication

Group 5C-Effects Of Pollution

LSU SC 73 01, p 283-289, 1973. 2 fig, 2 tab, 8 ref. ONR N00014r67-A-0115-0005.

spills. *Oil pollution. Descriptors: *Oil *Biodegradation, *Microbial degradation, Water

pollution effects.
Identifiers: *Oil spills, *Bacterial seeding, Oil herders, Dispersants, Mineralization

The effects on petroleum biodegradation of several oil herders, dispersants and commercial bacterial inocula were tested. The oil herders and dispersants significantly increased the rate of mineralization but not the extend of petroleum biodegradation. The beneficial effect is apparently due to the increased surface of oil droplets and an absence of toxicity to oil degrading microorganisms at the recommended concentrations. The two commercial bacterial inocula tested failed to improve either the rate or the extent of oil biodegradation when tested in natural seawater. In sterile seawater, these inocula showed inferior performance compared to the natural microflora of seawater, and were judged to be ineffective for marine applications. Data on the safety and effectiveness of available oil pollution control products are basic to their correct use. While numerous studies have been conducted on the toxicity of such products to vertebrates and invertebrates, little is known about their effects on the indigenous microflora of the sea. Since microbial degradation is the major natural process for the ultimate destruction of polluting oil, it is essential that this process not be interfered with. The recommended concentrations of two oil herders, six dispersants and two bacterial inocula were tested for their effects on the biodegradation of Sweden crude oil in freshly collected seawater samples. (See also W74-08609) (Sinha-OEIS) W74-08640

MICROBIOLOGICAL COMPARISON BETWEEN A FEW AQUATIC MEDIUMS, (IN FRENCH).

Poiters Univ. (France). Unite d'Enseignment et de

Recherche de Medicine et Pharmacie. F. Denis, J. Brisou, D. Courtois, and P. Niaussat

F. Denis, J. Brisou, D. Courtois, and P. Niaussat. Rev Epidemiol Med Soc Sante Publique, Vol 20, No 2, p 195-203, 1972. English summary. Identifiers: "Aquatic plants, Atlantic Ocean, Citrobacter, Empedobacter-trapanicum, Enterobacter, Euryhaline, "France, Lakes, Mediterranean Sea, Microbiological studies, Pacific Ocean, Phytobacterium, Pseudomonadaceae, Pictory, "Statistics," "Pacateria". Rivers, Salinity, *Bacteria.

Microbial flora samples taken from the following bodies of water were compared: the Atlantic Ocean, the Mediterranean Sea, Clipperton Atoll (Pacific Ocean), a hypersaline lake around Djibouti and from French rivers. The idea of a universal permanent microbial flora was outlined as well as the idea of a relatively specific microbiocenosis of a given medium. Most bacterial populations come under the large group of the euryhalines, which are under the large group of the eurynalmets, which are not affected by salinity. The marine medium selects halophilic bacteria strictly called weak, but their proportion does not exceed 10% of the microbiocenosis. In the hypersaline lake, only 1 type, Empedobacter (Halobacterium) trapanicum was isolated. This lake had a particularly high con-tent of bacilli unaffected by salinity. There are many ubiquitous types, namely the Citrobacter, Enterobacter. Pseudomonadaceae (Phytobacterium), the chromogenic bacteria and some bacilli which represent a type of background for all biotopes.—Copyright 1973, Biological Abstracts, Inc. W74-08669

PRELIMINARY PAPERS FOR UNESCO-IBP SYMPOSIUM ON PRODUCTIVITY PROBLEMS OF FRESHWATERS.

Polish Academy of Sciences, Warsaw. Polish Committee for IBP, PF Section, UNESCO-IBP Symposium Organizing Committee, Vol I, p 1-250, Vol II, p 251-577, 1970.

Descriptors: *Primary productivity, *Rivers, *Streams, *Lakes, *Productivity, Aquatic plants, Aquatic animals, Phytoplankton, Zooplankton, Turnovers, Biomass, Bacteria, Benthos, Fish, Predation, Diptera, Trophic level, Littoral, Fish management, Algae, Reservoirs, Photosynthesis, Ponds, Food chains, Heated water, Arctic, Tropic, Eutrophication, Michigan, Massachusetts Identifiers: *Chalk streams(England), *Salt lakes, USSR, Tyrol, Malaysia, Bulgaria, Poland, United Kingdom, Africa, Pyrenees, Netherlands, Kash-mir, Hungary, Czechslovakia, India, Italy, Nigeria, France, Japan, Moldavia, Malawi, Tchad.

Fresh water bodies ranging from the African tropics, Pyrenees, Netherlands, and northern Siberia were investigated. Usually, the climate and surrounding topography are discussed. The contributions differ greatly in scope. In general, seasonal variations and water chemistry are described: variations and water chemistry are described, changes in silicate, phosphate, and nitrogen com-pounds were recorded at Lake Tjeukemeer, Netherlands. Specific names of flora and fauna are listed, and in some cases, the higher plants. Some detailed studies of fauna behavior and relation to habitats were made. Production in a Polish lake was examined with detailed analysis of particular groups and dominating species and by estimating input and output of the ecosystem. Macrophytes afforded measurements of standing crops in Indian lakes. In one case, studies of species distribution in relation to sediment types were computed. Canadian Precambrian Shield Lakes afforded about 20 seasonal phytoplankton production studies with observations on zooplankton and methodology. Biological productivity efficiency at all trophic levels are recorded based on a four years' study of a Volga River reservoir. Diatom sedimentation and Daphnid populations were studied near London. Fish production and management are included in several papers. (Jones-Wisconsin) W74-08673

BIOLOGICAL METHODS FOR THE ASSESS-MENT OF WATER QUALITY. A SYMPOSIUM PRESENTED AT THE SEVENTY-FIFTH ANNUAL MEETING, JUNE 26-29, 1972.

American Society for Testing and Materials, Philadelphia Pa For primary bibliographic entry see Field 5A.

W74-08675

THE BRACKISH WATER CLAM RANGIA CU-NEATA AS INDICATOR OF ECOLOGICAL EF-FECTS OF SALINITY CHANGES IN COASTAL WATERS.

Texas A and M Univ., College Station. Dept. of

S. H. Hopkins, J. W. Anderson, and K. Horvath Available from the National Technical Informa-tion Service as AD-763 176; \$6.75 in paper copy, \$1.45 in microfiche. Contract Report No H-73-1, June 1973. 262 p, 53 fig, 24 tab, 273 ref. Contract No. DACW39-71-C-0007.

Descriptors: *Salinity, *Physiological ecology, *Bioindicators, *Animal physiology, *Environmental effects, *Variability, Reproduction, Laboratory tests, On-site tests, Water temperature, Food habits, Respiration, Salt tolerance, Water properties, Mollusks, Water quality, Clams, Animal behavior, Animal growth, Biomass, Saline water intrusion, Carbohydrates, Spawning, Growth rates, Animal metabolism, Ecosystems, Estuarine environment, Ecology, Brackish water,

Invertebrates.

*Rangia cuneata, Coastal waters, Seasonal variation, Osmoregulation, Enzyme activity, Survival, Trinity Bay, Lake Anahuac, Neches River, Trinity River Delta, Glycine, Gills, Glycogen, Macroinvertebrates.

Salinities in the range from 0 to 38 were tested on adult Rangia clams for: effects on survival; regulation of internal salinity; intake, use and release of amino acids; respiration; glycogen use under aerobic and anaerobic conditions; feeding rate; ciliary activity; uptake of glucose; glycogen storage and 'index of condition' in natural environments through a seasonal cycle; carbohydrate-digesting enzymes; and reproduction. Rangia cuneata has a system of compensating reactions that allows it to adjust to changes in salinity over the range from 0 to 38 ppt and over the temperature range from 10 to 35 C without harm. The key to the welfare of a Rangia population is not the physiology of the adult individuals, but reproduction and recruitment. The keys to the use of Rangia cuneata as an indicator were: a change on salinity, either up from near 0 or down from 15 ppt and above, is necessary to induce spawning; and the embryos and early larvae can survive only in salinities between 2 and 10 (or 15) ppt. On the basis of laboratory and field studies, the model proposed for Rangia in estuaries has the population consist-ing of: a central subpopulation in the most favorable breeding zone where the salinities between 2 and 10 ppt and the changes in salinity necessary for reproduction occur in most years; and a low salinity population upstream that is made up of one, two, or three year-classes resulting from larvae that were carried up the estuary, set, and survived in infrequent favorable (high-salinity) years; and (3) a similar subpopulation of one or a few year-classes downbay that set in years of freshets. Since a change in salinity, not just a favorable level, is required for reproduction, perfect stabilization of salinity at any level will result in dying out of the population in 15-20 years when old clams reach the limits of their life span. (Holoman-W74-08676

RESEARCH TO DETERMINE THE ENVIRON-MENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES.

AND UNDIKED TECHNIQUES.
Skidway Inst. of Oceanography, Savannah, Ga.
Available from the National Technical Information Service as AD-763 920; \$3.00 in paper copy, \$1.45 in microfiche. Annual Progress Report No 2, March 1973. 196 p. 25 fig, 46 tab, 9 ref. Contract No DACW-21-71-C-0020.

Descriptors: *Water pollution effects, Water quality, Fish, *Dredging, *Marsh plants, *Sediments, Heavy metals, Dissolved oxygen, Nitrates, Phosphates, Ammonia, Waste disposal, Spoil banks, North Carolina, South Carolina, Georgia, Marshes, Sampling, Hydrogen ion concentration, Biochemical oxygen demand, Water temperature, Salinity, Biomass, Iron, Population, Benthic fauna, Germination, Seeds, Vegetation establishment, Cadmium.

establishmeti, Caulillani.
Identifiers: *Macroinvertebrates, *Dredge spoils.
Species diversity, Recovery, Recolonization, Species diversity, Recovery, Recolonizati Separation alterniflora, Grease, Chlorophylla a.

Included were studies of water quality changes in polluted areas during dredging, effects of spoil impoundment on water quality, processes responsi-ble for water quality changes during dredging and after spoil disposal, sediment parameters which might provide a basis for predicting water quality changes during dredging, effects of dredging on fish, macroinvertebrates, and benthic infaunal populations, and regeneration of marshes. Major conclusions were: Water quality changes during dredging operations cannot be predicted on the basis of simple bulk chemical analyses of the sediments to be dredged. Significant variations in the quality of water leaving spoil areas can be ex-pected depending on its retention time in the spoil area. Since ammonia is the constituent released the greatest extent during the dredging of sedi-ments in general, one consideration that must be made in determining the optimum retention time of spoil material is the microphyte succession within spoil areas. Dynamic analytical techniques appear to provide a possibility of predicting the water quality changes that might occur during a dredging operation. Sampling for fish macroinvertebrates,

W74-08152

and benthos led to the following conclusions: (1) There apparently was no effect of dredging on standing crops or species composition in areas having undiked spoil banks. (2) In the one diked area examined, there was some indication that numbers of individuals and species were reduced following dredging for a period of approximately two months. (3) Diversity of fishes and macrointwo months. (3) Diversity of fishes and macroin-vertebrates over the two years of study was similar at most stations. (4) Benthos sampling in the vicinity of Altamaha Sound during 1972 con-firmed the reliability of the sampling method chosen. (5) Recolonization appears to occur very rapidly. (6) Data collection at Ossabaw Sound in dicate that the population standing crop in the Hell Gate dredging site was significantly higher than that at a control site. (Little-Battelle)

HETEROTROPHIC POTENTIAL FOR AMINO ACID UPTAKE EUTROPHIC LAKE, IN A NATURALLY

Corvallis. Dept. Oregon State Univ., Corvallis. Dept. of Microbiology.; and Oregon State Univ., Corvallis.

School of Oceanography.
K. B. Burnison, and R. Y. Morita.
Applied Microbiology, Vol 27, No 3, p 488-495,
March 1974. 5 fig, 2 tab, 29 ref. EPA 16010 EBB.

Descriptors: *Amino acids, *Microorganisms, *Eutrophication, Respiration, Inhibition, Aquatic microorganisms, In situ tests, Cyanophyta, Water temperature, *Oregon. Identifiers: *Heterotrophic potential, Mineraliza-

tion, *Klamath Lake(Ore).

The uptake of sixteen 14C-labeled amino acids by the indigenous heterotrophic microflora of Upper Klamath Lake, Oregon, was measured using the kinetic approach. The year-long study showed a seasonal variation in the maximum uptake velocity. Vmax, of all the amino acids which was proportional to temperature. The maximum total flux of amino acids by the heterotrophic microflora ranged from 1.2 to 11.9 micromol of C per liter per day (spring to summer). Glutamate, asparagine, aspartate, and serine had the highest Vmax values and were respired to the greatest extent. The percentages of the gross (net + respired) uptake of the amino acids which were respired to CO2 ranged from 2% for leucine to 63% for glutamate. Serine, lysine, and glycine were the most abundant amino acids found in Upper Klamath Lake surface water; at intermediate concentrations were alanine, asparate, and threonine; and the remaining amino acids were always below 7.5 X 10 to the minus 8 M (10 microgram/liter). The amino acid concentrations determined chemically appear to the sum of free and adsorbed amino acids, since the values obtained were usually greater than the (Kt + Sn) values obtained by the heterotrophic uptake experiments W74-08678

THE EFFECT OF MINERAL WATERS OF THE KVASY SPA ON SOME INDICES CO CHOLESTEROL AND SIALIC ACI METABOLISM, (IN RUSSIAN), Odessanst. for Health Resort Therapy (USSR). ACID

R. Ya. Kozachenko.

Vopr Kurortol Fizioter Lech Fiz Kul't, Vol 36, No.

Kvasv mineral water exerted hypercholesterolemic effect, facilitated excretion of cholesterol with the bile, intensified transformation of cholesterol into bile acids and stimulated the bile secretory function of the liver. The condi-tion of connective tissue was improved, as in-dicated by decreased blood levels of sialic acids. Mineral water had maximal effects after 18-24 days of administration in dogs. Kvasy mineral water is recommended as part of treatment for vascular disorders associated with disturbances of cholesterol and mucopolysaccharide metabolism and also for stimulation of bile secretion and liver function .-- Copyright 1973. Biological Abstracts. Inc. W74-08686

FREE-LIVING AMOEBAE ISOLATED FROM WATERS FREQUENTED BY PEOPLE IN THE VICINITY OF POZNAN: POLAND: EXPERI-MENTAL STUDIES IN MICE ON THE PATHOGENICITY OF THE ISOLATES, Medical Academy, Poznan (Poland). Dept. of Biological and Medical Parasitology.

W. Kasprzak, and T. Mazur.

Z Tropenmed Parasitol. Vol 23, No 4, p 391-398, 1972

Identifiers: *Acanthamoeba, *Amoebae, *Human diseases. Lung, Mice, Pathogenicity. *Poland(Poznan).

The investigations were instigated by the fact that free-living amoebae may cause lethal infections in man. The survey included 22 lakes, 1 river and 1 canal frequented by people in the area of Poznan. Small free-living amoebae were isolated from all samples examined. Almost all waters showed the presence of amoebae virulent for mice when given intranasally or intracerebrally. The amoebae invaded the brain and/or the lungs causing the death of animals within a period ranging from a few days to several weeks. Although the species composition of all the isolates was not identified, the greater part of the amoebae investigated belong to the Acanthamoeba genus .-- Copyright 1973, Biological Abstracts, Inc. W74-08687

SANITARY-MICRORIOLOGICAL INVESTIGA-TIONS IN PREVENTING INFECTIONS OF BACTERIAL AND VIRAL ETIOLOGY, (IN RUS-

SIAN), L. E. Korsh, G. A. Bagdasaryan, Yu. G. Talaeva, E. L. Lovtsevich, and T. Z. Artemova.

Vestn Akad Med Nauk SSSR. Vol 27, No 1, p 71-78, 1972.

Identifiers: Bacterial studies, *Human infections, Microbiological studies, Microorganisms, *Pseudomonas, Sanitary conditions, *Viral etiology, Water-borne viruses, *E. coli. Microorganisms,

The problems of general control and prophylaxis of bacterial and viral diseases are presented. Better methods of differentiation between various Enterobacteriaceae, such as Escherichia coli and Pseudomonas, better growth media, automation in colony counting, the use of radioisotpes, mem-brane-filters and different types of instrumentation are discussed. The enormous growth of cities and various facilities necessitates a better understanding and means of coping with the sanitary situations, expecially those of water. More sensitive and simple procedures for identifying and registering new water-borne microorganisms are needed. The effect of various chemical, physical and biological factors on the development, life and mutation of these pathogens should be investigated. Similar techniques should be applied for viruses .-- Copyright 1973, Biological Abstracts,

WATER QUALITY AND WATER POLLUTION

CONTROL IN SWITZERLAND, Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland). For primary bibliographic entry see Field 5G.

5D. Waste Treatment Processes

OPTIMIZATION OF THE ASSIMILATIVE WASTE CAPACITY OF THE UNSATURATED AND SATURATED ZONES OF AN UNCON-FINED AQUIFER SYSTEM,

Univ., of California, Los Angeles. School of En-gineering and Applied Science. For primary bibliographic entry see Field 5B.

APPLICATION OF REVERSE OSMOSIS TO ACID MINE DRAINAGE TREATMENT,

Environmental Protection Agency, Rivesville, W. Va., Crown Mine Drainage Control Field Site. R. C. Wilmoth

Copy Available from GPO Sup Doc as EP1.23:670/2-73-100, \$2.00; microfiche from NTIS as PB-232 449, \$1.45. Environmental Protection Agency, Technology Series Report, EPA-670/2-73-100, December 1973, 157 p, 33 fig. 56 tab, 22 ref. EPA Program Element 1BB040/21AFY/31. Project 14010 TMC

Descriptors: *Acid mine drainage, *Waste water treatment, *Reverse osmosis, Water reuse, *Calcium sulfate, Coal mines, Brine disposal, Water pollution control, Iron, *West Virginia, Manganese, *Pennsylvania. Identifiers: *Neutrolosis, Water recovery.

Spiral-wound reverse osmosis systems were tested on four different acid mine drainage discharges in West Virginia and Pennsylvania. Comparison stu-dies were made of the hollow-fiber, tubular, and spiral-wound systems at a ferrous iron acid discharge; and of hollow-fiber and spiral-wound systems at a ferric iron acid discharge. At all sites, the limiting factor in high recovery operation was calcium sulfate insolubility. An empirical formula was developed for predicting maximum recovery. Application of reverse osmosis was demonstrated to be technically feasible for a large percentage of acid mine drainage discharges. A process called 'neutrolisis' was developed in which the reverse osmosis brine is neutralized and clarified, and the supernatant recycled to the influent to the reverse osmosis unit. In this manner, the neutrolosis process discharges only a high quality product water and a neutralized sludge. Neutrolosis recoveries as high as 98.8 percent were achieved at ferric iron acid discharge site. (EPA) W74-08155

BEEF CATTLE FEEDLOT SITE SELECTION FOR ENVIRONMENTAL PROTECTION, Robert S. Kerr Environmental Research Lab.

Ada, Okla. National Animal Feedlot Wastes Research Program.
For primary bibliographic entry see Field 5G.

W74-08156

AN EXPERIMENTAL IRRADIATION FACILITY FOR THE STERILIZATION OF SEWAGE SLUDGE (EINE VERSUCHSBESTRAHLUNG-SANLAGE ZUR HYGIENISIERUNG VON KLAERSCHLAMM),

Bayerische Landesanstalt fuer Bodenkulter, Pflanzenbau und Pflanzenschutz, Munich (West

A. Suess, H. Moetsch, E. Bosshard, G.

Schurmann, and O. Luescher. Kerntechnik, Vol 16, No 2, p 65-70, 1974, 4 fig. 11

Descriptors: *Waste water treatment, *Pilot plants, *Sewage sludge, *Sludge treatment, *Irradiation, Treatment facilities, Cobalt.

An experimental plant for sterilization of sewage

sludge by irradiation with a 120kCi Co60 source is described. The main components of the facility are the irradiation shaft with a built-in central tube in which the sludge is recirculated during irradiation.

Group 5D—Waste Treatment Processes

and the recirculation system which consists of an and the recirculation system which consists of a accessible pump shaft with recirculation and evacuation pumps, the necessary shutoff and regulation valves, and pipework. In this system untreated digested sludge is pumped from the conventional part of the sewage treatment plant to an above ground silo in which a voiding valve opens and allows a metered quantity of sludge to flow into the irradiation chamber upon signal. In the chamber the sludge is recirculated and forced to flow past both sides of the radiation sources for a certain predetermined time. The filling and voiding times of the irradiation chamber are at present about six minutes each. (Sandoski-FIRL) W74-08198

THE CHEMICAL TREATMENT OF MUNICIPAL WASTE WATER (ZUR CHEMISCHEN BEHANDLUNG VON STAEDTISCHEN ABWAS-SERN),

Institute for Water and Air Pollution Research, Stockholm (Sweden).

H. O. Bouveng. Staedtehygiene, Vol 25, No 11, p 260-261, 1973.

Descriptors: *Chemical precipitation, *Waste water treatment, *Municipal wastes, Treatment facilities, *Biochemical oxygen demand, Phosphorus.

*Sweden, Switzerland, Finland, Identifiers: *Chemical treatment.

The Swedish government has adopted a policy of financing 50 percent of the construction costs of municipal purification plants provided a 90 percent reduction of BOD and of the total phosphorus is achieved. This action has spurred the addition of chemical stages to the mechanical biologic purification plants since this stage has a higher BOD reduction capability. In Switzerland and Finland, simultaneous treatment through chemical precipitation is the most common practice. Incor-poration of this phase into the existing purification plant scheme allows for better phosphorus con-centration. (Sandoski-FIRL) W74-08199

SMALL BALLS REPEAL SMELL, Capricorn Industrial Services, Ltd., London H F Raum

Water and Wastes Engineering, Vol 11, No 3, p 41-42, March, 1974. 2 fig.

Descriptors: *Sewage treatment, Activated sludge, *Liquid wastes, *Waste water treatment, *Odor, Pollution abatement, Air pollution. Descriptors: Identifiers: *Great Britain, Ball blanket.

Tests at a British sewage plant show that smell can be virtually eliminated by covering liquid sewage with a ball blanket, the name given to a closely packed layer of hollow plastics balls floating on the surface of a liquid. Special polypropylene balls are used. A complete layer of balls arranged in staggered rows always covers 91% of the surface. The remaining 9% consists of small air pockets between the balls which can inhibit fumes emission from the surface in a liquid. Balls of 45 mm diameter were used to cover two 16 sq ft open sludge tanks. Immediately after the whole surface was covered, the smell of the sludge became unde-tectable. From additional laboratory tests it appears that the ball blanket encourages the water separation process. Other possible uses of balls for sewage treatment are being considered including their effect on agitated liquids and in reducing the amount of foaming in the tank. (Merritt-FIRL)

KNOWLEDGE CRISIS IN SOLID-FLUID SEPARATION.

Chemical Engineering, Vol 81, No 7, p 26, 28, April 1, 1974. 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Separation techniques, *Research and development, Industrial water, Water pollution control, Dewatering. Identifiers: Solid-fluid separation.

Some opinions of world experts in solid fluid separation on ways to close the solid-fluid-technology knowledge gap are presented. There is wider support for education and research in England, Japan, and Germany than in the United States because of greater population density which overloaded the capacity of the rivers and forced the technology. Other countries also have closer ties between educators and industry. Industry in the United States gives little research opportunities to universities. Most industrial research is done from within the company. The industrial application of solid fluid separation, including pollution control, which most needs improvement includes: hydrometallurgy, activated sludge separa-tion, metal-hydroxide removal, alum sludge dewatering, sulfur dioxide removal systems, pigment and dyestuff processing, clarification of liquids in and uyesturt processing, chartication of liquids in the food and beverage area, sewage sludge de-watering, radioactive material concentration, shale oil separation, tar sands separation, and removal of ash from liquefied coal. (Merritt-FIRL) W74-08202

WATER RESOURCES: KEY TO WESTERN FU-TURE.

For primary bibliographic entry see Field 5G. W74-08204

THE ROLE OF DISINFECTION IN THE OP-TIMUM ENVIRONMENT,

For primary bibliographic entry see Field 5F. W74-08205 Georgia Inst. of Tech., Atlanta.

OXYGENATION SYSTEM FOR AC-CELERATED SEWAGE TREATMENT FMC Corp., Englewood, Colo. Div. of Environmental Equipment.

R. B. Weber. Mechanical Engineering, Vol 96, No 3, p 28-33,

March, 1974. 7 fig, 4 ref.

Descriptors: *Sewage treatment, *Oxygenation, *Waste water treatment, Performance, Capital costs, Testing, Operating costs, Treatment facili-

Identifiers: *Oxygen diffusion, *Passive diffuser system, *Active diffuser system.

The use of pure oxygen in sewage treatment has been investigated for several years; however, the acceptance of a pure oxygen system has been delayed due to a lack of satisfactory methods of diffusing oxygen into the sewage. The two types of systems detailed herein are designated as the passive system and the active system. The passive system has recently been installed at a waste sive system has recently even instance at a waste treatment facility which handles a relatively high BOD waste. Testing the system has demonstrated that excellent bubble quality exhibiting greater than 95 percent efficiency of oxygen transfer in deep water is provided and that bubble quality does not degrade with time because of plugging or corrosion. The active system is being evaluated for performance in aerobic digestion of waste activated sludge. Results of batch and flow-through tests indicate superior wastewater treatment per-formance at a lower capital expenditure and lower operating cost when compared to existing systems. (Sandoski-FIRL) W74-08207

POTABLE-WATER SUPPLY BY MEANS OF UP-FLOW FILTRATION PROCESS). (L'EAU

of Tulane Univ., New Orleans, La. Dept. of Civil Engineering. For primary bibliographic entry see Field 5F. W74-08210

ALL COSTS MUST BE COUNTED . . Camp, Dresser and McKee, Boston, Mass.

Water and Wastes Engineering, Vol 11, No 3, p 49-51, March 1974. 2 fig.

Descriptors: *Waste water treatment, *Costs, *Sludge, Engineering, *Sludge treatment, Costs analysis, Recycling.

The determination of the costs of sludge and sidestreams is discussed. Often these costs are not properly identified, especially when relatively polluted streams are recycled. Recycling can significantly affect the loading on the process generating the stream and other processes, both directly and indirectly. To ensure that all pertinent costs are recognized, design engineers should consider the use of a complete flow diagram which quantita-tively identifies all the recycled streams. By analyzing overall costs according to this scheme, it is possible to determine proper loadings, under equilibrium conditions, on various processes and equipment in the treatment plant. The analysis involve mass balance and a knowledge of the biological, physical, and chemical conversion processes. (Merritt-FIRL) W74-08211

AUTOMATIC PROCESS CONTROL SEWAGE TREATMENT WORKS, Bolivar Treatment Works (South Australia).

R. H. Casling. PACE, Vol 26, No 12, p 14-19, December 1973. 7 fig.

Descriptors: *Sewage treatment, *Automatic control, trol, Activated sludge, Filtration, Sewage disposal, Operating costs, Instrumentation, Aeration, *Waste water treatment,
*Treatment facilities.

The sewage treatment processes employed in the new major plants to be found in the principal cities of Australia are described including the steps being taken to instrument and control them. Such plants, designed to process the sewage from populations in excess of 50,000 people can be economically instrumented and automated. Conventional sewage treatment is a combination of mechanical, physical, and biological processes. The intimate contact between the oxygen and sewage which is the essential part of secondary treatment is achieved in one of two ways. In activated sludge plants, the air is provided by air compressors with capacities of thousands of cubic feet of air per minute at pressures of approximately 6-8 lb/sq in In filter plants, the settle sewage is distributed over thick beds of stone of graded size by some type of distributor fitted with spreading nozzles. The process parameters measured and used in treatment works can be classified as those concerned with physical quantities and those termed fluid characteristics as dissolved oxygen level, suspended solids, and BOD5. Automatic controls are used which have reduced the operating costs at the major treatment works while giving a standard of control which is closer to the optimum than can be achieved by manual means. (Merritt-FIRL)

BEST EFFLUENT THE GOAL,

Daniel, Mann, Johnson, and Mendenhall, Los Angeles, Calif. J. E. Cotter.

Water and Wastes Engineering, Vol 11, No 2, p 46-49. February 1974, 4 fig.

Descriptors: *Effluents, Automatic control. Water reuse, Water treatment, Waste water, Activated sludge, Sewage, Facilities, Filters, Computers, Instrumentation, Engineering, *Waste water treatment, *California.
Identifiers: *Plant design, *Los Angeles(Calif).

Waste Treatment Processes—Group 5D

The advanced control system which is being installed to aid water reuse at the Sepulveda Water Reclamation Plant is described. The plant will provide secondary treatment by an activated sludge process. In addition, the effluent from the final settling tanks will be passed through filter beds for final polishing in order to make it suitable for its end use. Raw sewage in amounts up to 40 mgd will enter the headworks of the plant through screw pump lift stations. The plant will have a distinctive control system in that almost all control outputs will be derived from direct digital control logic supplied by a central computer system. In addition, all inputs and outputs to the process will be multiplexed remotely in the field and transmitted in serial digital form to the computer center over a common communications cable. (Merritt-FIRL) W74-08214

VIRUS REMOVAL BY DIATOMACEOUS-EARTH FILTRATION - PART 1, Gibbs and Hill, Inc., New York, N.Y. For primary bibliographic entry see Field 5F. W74-08215

THE RIVER ITCHEN SCHEME OF THE PORT-SMOUTH WATER COMPANY. For primary bibliographic entry see Field 8A.

THE AUTOMATIC FILTER PRESS FPAKM (DIE AUOTOMATISCHE FPAKM), (DIE FILTERPRESS I. S. Ermakov, and M. J. Mesengisser.

Chemische Technik, Vol 26, No 1, p 32-33, 1974. 3

Descriptors: *Filters, *Automation, *Sludge treatment, Sewage sludge, Application methods, Equipment, *Waste water treatment. Identifiers: *Filter press, Filter plates.

An automatic chamber filter press with horizontally arranged filter plates that can be moved electromechanically or hydraulically up and down is described. The endless filter band is conducted over rollers back and forth through the filtering chambers which are formed by the filtering plates. The upper section of the filtering plates forms the chamber for draining off the filtrate, the lower section forms an open frame which upon closing of the filter plates forms the chamber for formation of the filtering cake. Between upper and lower sections of the filter plates a rubber membrane is in-stalled for separation of the liquid phase by water or compressed air. The operating time for opening, cake discharge, and closing takes about one to two minutes. The application of the chamber filter for sludge-containing industrial and communal wastewater is being tested. In Japan as well as the Soviet Union, this filter press is used for dewatering of sewage sludges. (Sandoski-FIRL) W74-08217

REVERSE OSMOSIS AND ULTRAFILTRATION - A SURVEY OF AUXILIARY APPARATUSES AVAILABLE IN THIS FIELD (UMGEKEHRTE OSMOSE UND ULTRAFILTRATION - EIN UEBERBLICK UEBER DIE AUF DIESEM GEBIET VERFUEGBAREN APPARATIVEN HILFSMITTEL), Alfa-Laval A.B., Tumba (Sweden).

J. Murkes.

Chemische Technik, Vol 25, No 10, p 601-603, 1973. 4 fig.

Descriptors: *Reverse osmosis, *Membrane processes, *Surveys, Application methods, *Desalination, *Waste water treatment, Identifiers: Frame modules, Tubular modules, Spiral modules, Capillary fiber modules, *Ultrafiltration.

The principle of reverse osmosis is explained and a survey of the following apparatuses given: plate and frame modules, tubular modules, spiral modules, capillary fiber modules, and ultrafiltration modules. In plate and frame modules, round membranes are fastened to a porous supporting material and stacked in a pressure-resistant casing. With tubular modules, membranes are inserted into a tubular permeable supporting structure similar to the spiral modules but with a smaller membrane surface. Capillary fiber modules are comprised of many aromatic polyamide fibers with a large specific membrane surface and whose throughput is smaller than with plane or tubular cellulose acetate membranes. (Sandoski-FIRL) W74-08218

MEASUREMENT AND MONITORING UNITS FOR WASTE WATER (MESS-UND UEBERW-WACHUNGSGERAETE FUER ABWASSER), For primary bibliographic entry see Field 5A. W74-08219

PLANT EXPANDED FOR ADVANCED WASTE

TREATMENT, URS Forrest and Cotton, Inc., Dallas, Texas. D. P. McDuff, and D. B. Ward. Public Works, Vol 105, No 3, p 56-59, March 1974.

Descriptors: *Tertiary treatment, *Sewage treat-*Trickling filters, Water quality, Pre-treatment(Water), Filtration, Aeration, Adsorption, Disinfection sludge treatment, Dewatering, *Waste water treatment, Biochemical oxygen demand, Suspended solids, Water purification, Scum, *Treatment facilities, *Texas. Identifiers: Recarbonation.

The expansion of the sewage treatment facility at Garland, Texas is described. It will feature a new and innovative treatment unit in parallel with an existing trickling filter plant in order to meet the demand for high quality waste effluent. The plant is designed to increase the capacity from 7.5 to 30 mgd and to provide treatment objectives of reduc-ing both BOD and suspended solids to a concen-tration of less than 10 mg/liter. The proposed additional treatment processes at the existing plant in-clude: equalization and aeration, pretreatment, chemical clarification, recarbonation, filtration, carbon adsorption, disinfection, sludge dewatering, and scum disposal. (Merritt-FIRL) W74-08223

PRIMARY SLUDGES PRODUCED BY THE AD-DITION OF LIME TO RAW WASTE WATER, Washington Univ., Seattle. Dept. of Civil En-

gineering. G. R. Minton, and D. A. Carlson. Water Research, Vol 7, No 12, p 1821-1947, 1973. 10 fig, 8 tab, 45 ref.

Descriptors: *Sludge, Waste water, *Lime, Hydrogen ion concentration, *Waste treatment, Water purification, Activated sludge, Dewatering, Review, *Waste water treatment.

Information compiled on the primary sludge produced by the addition of lime to the raw waste water is summarized. The removal of moisture water is summarized. The removal of moisture content of primary sludges containing lime will vary significantly with the waste water hardness/alkalinity, insolubilization, pH, and possibly the phosphorus concentration. The recommended minimum insolubilization pHs to ensure satisfactory thickening, vacuum filtration, sand bed drying, and centrifuging are tabulated. The minimum insolubilization pH required for satisfactory clarification corresponds to the minimum insolubilization pH for satisfactory removal of sludge. bilization pH for satisfactory removal of sludge moisture content with the possible exception of vacuum filtration. The degree to which the capacity and/or operating hours of the existing moisture removal processes must be increased to handle the

new sludge will depend upon the aforementioned waste parameters and the existing operating characteristics, solids contents, and loading rates of the facility. Lime will significantly alter the quantity, composition, and quality of the solids and sludges produced by the treatment process.
(Merritt-FIRL) W74-08224

AUTOMATION COMES TO L.A., Brown and Caldwell, San Francisco, Calif. M. J. Flanagan, and G. M. Jones. Water and Wastes Engineering, Vol 11, No 2, p 41-46, February 1974. 7 fig.

Descriptors: *Automatic control. *Waste water treatment, *Sewage treatment, Activated sludge, Effluents, Computers, Digestion, *California. Treatment facilities.
Identifiers: *Los Angeles(Calif).

An expandable automated control system which will permit the addition of improved processing techniques as they become available is being installed in a Los Angeles waste water plant. The Hyperion sewage treatment plant provides primary treatment for an average dry weather flow of 420 mgd and a peak wet weather flow of 720 mgd. Secondary treatment by the activated sludge process is provided to a constant flow of 100 mgd. Under dry weather flow conditions, primary and secondary effluent are mixed and discharged to Santa Monica Bay through a 5 mi long outfall. When excessive wet weather flows impose too great a load on the 5 mi conduit, effluent from the activated sludge process is discharged through the plant's original 1 mi outfall. Solids from the treatment process are discharged through a 7 mi outfall after reduction by the anaerobic digestion process. (Merritt-FIRL)

THE PROS AND CONS OF AUTOMATED FIL-TERS.

Gary-Hobart Water Corp., Gary, Ind.

C. A. Froman, Jr. Water and Wastes Engineering, Vol 11, No 3, p 43-44, 48, March 1974. 1 tab.

Descriptors: *Filtration, Economics, Water treatment, *Filters, Automation, Operation and main-tenance, *Maintenance costs, *Waste water treat-

The advantages and disadvantages of automated filters are discussed. An automated filter is defined as a filter with numerous automated features and is run without an operator who routinely inspects the filter during operation and is not in attendance during the backwashing function. Some common problems that have been associated with filter plant operations are filter bed clogging. cracks in filter bed, air binding, gravel shifting and sand boils, and loss of filter media. Some of these problems could be avoided if an operator were in attendance, therefore, the biggest disadvantage of automated filters is the loss of direct operator ob-servation and control of process. Other disadvantages include the investment required, high maintenance costs and depreciation. Advantages include economy in operation and maintenance consistency of operation. One plant estimates its total annual savings at \$17,500. (Merritt-FIRL)

THOSE NASTY PHOSPHATIC CLAY PONDS. Environmental Science and Technology, Vol 8, No 4, p 312-313, April 1974. 2 fig.

Descriptors: *Phosphates, *Slime, *Dewatering, Flocculation, Coagulation, Dryers, Economics, Feasibility, Sands, Flocculation, Filtration, *Waste water treatment.

Group 5D—Waste Treatment Processes

Methods of dewatering phosphate slimes are discussed. There are about 40,000 acres of active and inactive settling areas of phosphate slimes that are surrounded by over 300 miles of earth dams. Since 1942, some 20 dam failures occurred, releasing large amounts of phosphate slimes, and seriously, although temporarily, polluting surrounding waters. Two dewatering methods are deemed technically feasible and economically promising.

One is mixing with tailings sand, and the other is chemical flocculation together with coagulation with tailings sand. Other possible methods include filtering and the use of a cross flow fluid bed dryer. The possibility of utilizing the slime is also being explored in areas of fertilizers, bricks, and sewer pipes. (Merritt-FIRL) W74-08227

COUNTERCURRENT WASHING TURNS THE TIDE AGAINST RISING EFFLUENT COSTS, Pierson and Co., Ltd., Manchester (England). H. G. W. Pierson. Progress Engineering, p 47, February 1974. 2 fig.

Descriptors: *Cleaning, *Filtration, Effluents, Treatment, Costs, *Waste water treatment. Identifiers: *Great Britain, Countercurrent wash-

The use of countercurrent washing to reduce the volume of effluent by half and so reduce treatment cost is discussed. The countercurrent washing process is illustrated for a long slab like filter cake. The filter cake travels from left to right while the successive washes are piped the other way. Each of the three portions of the cake is washed three times. At each washing the filter cake has a higher concentration of soluble solids than the wash water and so the concentration of impurities in the cake is decreased at every washing. A 1% level of impurities can be obtained in a three stage countercurrent washing compared to a four stage countercurrent washing process. (Merritt-FIRL) W74-08228

NEW TERTIARY SEWAGE PROCESS NEEDS

NO CHLORINE TO DISINFECT.
Engineering News-Record, Vol 192, No 8, p 23, February 21, 1974.

Descriptors: *Tertiary treatment, *Disinfection, *Waste water treatment, Water purification, Ozone, Ultrasonics, Aquatic microorganisms. Identifiers: *Ultrahigh frequency sound.

A tertiary waste water treatment process was developed that combines ultrahigh frequency sound with ozone and could replace chlorination for disinfection. Chlorine leaves a toxic residue that can be harmful to aquatic life. The cost of an entire 1 mgd physical/chemical plant using the process would be competitive with an activated sludge plant the same size. It would be feasible to expand the process for use on plants in the 50 mgd range. The process kills most viruses within 15 range. The process kins most vitues within 15 sec, as compared to 1-2 min when using ozone alone. Currently, a 27,000 gpd pilot plant is in operation, with plans for a 600,000 gpd sonozone plant. (Merritt-FIRL) W74-08229

ANIMAL WASTE UTILIZATION FOR POLLU-TION ABATEMENT TECHNOLOGY AND ECONOMICS. PHASE II,

Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.

Available from the National Technical Informa-tion Service as PB-232 409 \$3.25 in paper copy, \$1.45 in microfiche. Nebraska Water Resources Research, Lincoln, Institute Project Completion Report, February 1974. 15 fig, 2 tab, 6 ref. OWRR B-012-NEB(2). 14-31-0001-3610.

Descriptors: *Water pollution sources, *Farm wastes, *Runoff, Waste disposal, Fertilizers, Irrigation practices, Return flow. Identifiers: Land disposal(Wastes), Manure Identifiers: disposal.

The pollution potential of the runoff from manured soil involves nitrate, sodium, and potassium. High manure applications to cultivated soils will cause limited pollution of surface runoff water and only during the first 15 minutes of the first runoff event. The concentration of pollutants in this runoff water is below the limits set for irrigation water. Hence, all runoff should be recycled for irrigation uses. After 4 years of testing heavy manure application, groundwater retained potable quality. Repeated annual application of heavy rates of manure on land may lead to deterioration of the physical properties of soil, owing to the large amounts of sodium and potassium in manure. In 1972 and 1973 these two elements did not continue to increase in concentration. Also, feeding excess quantities of sodium and potassium beyond the minimum requirement for the animals is being avoided. The initial intake of water into the soil increases as high manure loadings are applied. The basic intake rate is higher on areas plowed 8 inches deep. The basic intake rate on any specific manure loaded area increases with time elapsed from date of manure application. (See also W71-11405) (Knapp-USGS) W74-08231

ADVANCED WASTE TREATMENT PROCESS SELECTION, PART TWO, Culp Wesner Culp - Clean Water Consultants,

Corona Del Mar, Calif.
G. L. Culp, and C. L. Hamann.
Public Works, Vol 105, No 4, p 69-74, April, 1974. 5 fig, 3 tab.

*Oxidation, *Phosphorus, *Adsorption, *Ozone, *Chemicals, Economics, Activated carbon, Iron, Aluminum, Application methods, Sewage treatment, *Waste water treatment, Organic wastes, Coagulation, Salts. Identifiers: Powdered carbon, Granular carbon, Phosphorus removal.

The use of chemical oxidation and adsorption for removal of organics and application of coagulants for phosphorus reduction are discussed. Chemical oxidation processes showing any potential for economic use are limited to ozonation as the technique available at lowest cost. Chemical oxidation steps are unacceptable for application to removal of organics from raw sewage. Carbon adsorption may be applied to raw sewage for removal of organics rather than using biological processes, or it can be applied to secondary effluents. Powdered carbon and granular carbon adsorption, regeneration, and reuse are compared. Chemical coagulants for phosphorus removal may be added to the primary clarifier influent, the activated sludge aeration tank, or a tertiary chemical clarifier. The use of iron and aluminum salts as coagulants in the aforementioned treatment stages is discussed. (Sandoski-FIRL) W74-08245

RELIEF CONCEPT CONCERNING MIXED SEWERS (ENTLASTUNGS-KONZEPTIONEN IM MISCHSYSTEM),

Gas- and Wasserfach - Wasser/Abwasser, Vol 114, No 11, p 525-529, 1973. 4 fig. 11 ref.

*Combined Descriptors: sewers. Watersheds(Basins), *Rainfall, *Storm runoff, Waste water treatment. Identifiers: *Sewer overflows.

The installation of rain catchment basins to protect the receiving streams from overflowing combined sewer systems has been an accepted practice for many years. These basins have the purpose of

holding certain quantities of water during a rainfall, which is later returned to the purification plant for treatment. Calculation methods for construction of rainfall catchment basins are tabulated. (Sandoski-FIRL) W74-08246

NEW METHODS TO DISPOSE OF USED METALWORKING EMULSIONS, (NEUE VERFAHREN ZUR BESEITIGUNG GEBRAUGHTER METALL-BEARBEITUNGS-EMULSIONEN), Esso AG Forschungszentrum, Hamburg (West Germany).

U.J. Moeller, U. Boor, and G. Runge. Erdoel und Kohle-Erdgas-Petrochemie vereinigt mit Breunstoff-Chemie, Vol 27, No 2, p 70-77, 1974. 11 fig, 11 tab, 32 ref.

Descriptors: *Emulsions, *Separation techniques, *Oily water, *Burning, Landfills, Waste disposal, Absorption.
Identifiers: *Flame evaporation.

A new method, flame evaporation, has been developed to separate emulsion into water and oil with the aid of heavy fuel oil. The water content of the emulsion is converted to steam and removed through the stack. Simultaneously, the oil phase and the auxiliary fuel oil is combusted to CO2 and water. The consumption of the heavy fuel oil is low; the heat of combustion of the emul-sion and auxiliary fuel can be utilized. Disposal of emulsion by the landfill method includes the absorption of the oil phase onto aluminum hydroxide and the placement of the oil floc/water mixture in earth pits having a water permeable lining. The oil is converted to a usable compost by means of microorganistic activity or through use of activated sludge within six months. (Sandoski-FIRL) W74-08247

FURNACE CONSTRUCTIONS FOR INCINERA-TION (OFENKONSTRUKTIONEN FUER DIE ABFALLVERBRENNUNG).
Wasser, Luft and Betrieb, Vol 18, No 1, p 28-30, 1974. 4 fig.

Descriptors: *Treatment facilities, *Incineration, *Waste treatment, *Liquid wastes, Sewage sludge. Identifiers: Rotary kiln, Fluidized bed furnace, Radiation recuperators.

Various kinds of furnaces for incineration of a wide variety of waste products such as odorous wastes gases, communal and industrial sludges, and solid wastes are described. Such incineration processes include a fluidized bed furnace, radiaprocess in the specific treatment of liquid and gaseous wastes. In this process, waste products are injected to the combustion chamber via concentrically arranged burners after which fuel is injected through fine nozzles in a ring around the burners. As combustion products, sulfur dioxide and hydrogen chloride develop apart from water vapor and carbon dioxide which are removed in scrubbers. (Sandoski-FIRL) W74-08248

RECONSTRUCTING AN EGG-SHAPED SEWER.

For primary bibliographic entry see Field 8A.

DISINFECTION OF WATER USING CHLORINE DIOXIDE,

Wallace and Tiernan, Inc., San Francisco, Calif. F. Malpas. Water Treatment and Examination, Vol 22, No 3, p 209-221, 1973. 1 tab, 14 ref.

Descriptors: *Disinfection. Sewage treatment. *Swimming pools, Potable water, Water purifica-tion, *Waste water treatment, *Chlorination. Identifiers: *Chlorine dioxide, *Great Britain.

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The use of chlorine dioxide for the disinfection of water is discussed. Although chlorine dioxide is widely used as a water treatment chemical for the specific purpose of taste removal, it is not generally thought of as an alternative to chlorine for disinfection. It is pound for pound far more expensive than chlorine, yet does not appear to have outstanding germicidal properties. There does appear to be three areas in which chlorine dioxide could be used advantageously as a disinfectant: firstly, in the potable water field, where abstraction from rivers high in ammonia makes break point chlorination impossible, or difficult; secondly, for the disinfection of sewage effluents; and lastly, in swimming pools because chlorine dioxide reportedly does not cause eye irritation. (Merritt-FIRL)

ENVIRONMENTAL EFFECT OF A COMPLEX NUCLEAR FACILITY,

DuPont de Nemours (E.I.) and Co., Aiken, S.C. W. P. Bebbington.

W. P. Beddington.
Chemical Engineering Progress (Certification of Engineers), Vol 70, No 3, p 85-86, March, 1974. 1 fig.

Descriptors: Liquid wastes, *Environmental effects, Nuclear wastes, Salts, *Waste disposal, Waste storage, Sludge storage, Storage tanks, *South Carolina, Water pollution effects. Identifiers: *Savannah River(So. Car.).

The storage and disposal of liquid wastes from the Atomic Energy Commission's Savannah River Plant are described in a discussion of the environmental effect of a complex nuclear facility. Most of the solids in the highly radioactive liquid wastes from the separations processes are nonradioactive salts containing aluminum and inorganic reagents. Sodium hydroxide is added and the volume of the alkaline waste is as much as 100 times that generated in the power reactor fuel cycle. This alkaline waste is stored underground in carbon steel tanks, most of which are enclosed in wholly or partially steel lined concrete vaults. Hydrated iron, manganese, and aluminum oxides occur as a sludge that settles from the waste and contains nearly all of the strontium-90. Sludge from several tanks has been combined into one tank. This supernatant liquid contains nearly all of the cesium-137. This solution is concentrated in evaporators, several tanks are now being filled with the resultant crystalline salts. (Merritt-FIRL)

IMPROVED CONTROL OF RADIOACTIVE WASTES

WASTES, Atomic Energy Commission, Bethesda, Md. F. E. Stubblefield, and E. G. Jackson.

F. E. Stubblefield, and E. G. Jackson. Chemical Engineering Progress (Certification of Engineers), Vol 70, No 3, p 87-88, March, 1974. 3 fig.

Descriptors: *Radioactive waste disposal, *Radioactive wastes, *Liquid wastes, Solid wastes, Waste storage, *Water pollution control, *Washington. Identifiers: Plutonium, Uranium, *Richland(Wash).

Improved control methods are described for solid and liquid radioactive wastes at the Hanford plant of the Atomic Energy Commission at Richland, Wash. Previously, solid wastes were buried as received with no provisions for retrievability. The expansion of land use at a rate of 3.7 acres/yr necessitated the following improved procedure: segregate transuranic contaminated waste from other radioactive waste; segregate combustible and noncombustible transuranic waste; package the transuranic contaminated waste in retrieval type packages, and store in soil such that retrieval of contamination free packages can be accomplished for at least 20 yr after initial storage; implement volume reduction measures at the generation

facility; implement improved land utilization; consolidate sites where practical, thus releasing land areas from contamination restriction. Liquid wastes were previously discharged to ground disposal sites, on surface ponds or swampls, or to subsurface structures (cribs) depending on the amount of total radioactivity. The improved method involves: process changes including the addition of effluent treatment facilities to minimize the amounts of radioactivity in stream; diversion facilities; and storage of plutonium containing streams in tanks. (Merritt-FIRL)

LETCHWORTH WATER POLLUTION CONTROL WORKS,

E. Taylor. Public Health Engineer, No 7, p 21-34, January, 1974. 1 fig, 8 tab.

Descriptors: Water pollution control, *Costs, *Activated sludge, Intakes, Sedimentation, Separation techniques, Sludge digestion, Sludge disposal, Sludge treatment, Filters, Filtration, *Waste water treatment, Pumps, Pumping plants, Equipment, *Treatment facilities.

Identifiers: *Great Britain(Letchworth).

The extension of the Letchworth Water Pollution Control Works to a 4-5 mgd facility based on the diffused air activated sludge process is described. The numbers, dimension, and capacities of the following individual units are tabulated: inlet works, sedimentation tanks, aeration tanks, final settlement tanks, sludge pumps, sludge digestion tanks, sludge filter presses, biological filter beds, scavenge pumping stations, the administration building and compressor house, and tank washout and washdown facilities. The construction costs of the extension are tabulated and total about \$3 million. (Merritt-FIRL)

SEWAGE TREATMENT AND DISPOSAL. Water and Water Engineering, Vol 77, No 934, p 495-498, December, 1973. 2 fig.

Descriptors: Facilities, *Sewage treatment, *Waste water treatment, Water management(Applied), Waste disposal, Irrigation systems, Flood damage, Boating, Treatment facili-

Identifiers: *Flood relief, *Great Britain, *Greece.

New sewage treatment and disposal facilities and projects are summarized. A water management study on treating sewage at Melbourne is being conducted. New sewers are being proposed for Banstead Urban District Council (UDC) and Bedworth UDC. Four automatic pumps were installed at the Faversham Sewage Works. New facilities have opened at the Isle of Sheppey, Northallerton Rural District Council (RDC), Village, Rugby Newbold, Spalding RDC. Stokesley RDC, Winchester RDC, and Zambia. In the United States, the Rosemont Treatment plant is being evaluated by the Environmental Protection Agency. A recent ruling made it unlawful to prohibit the discharge of sink waste from boats on streams in the area of the Lancashire River Authority. An important water management scheme is being developed in Greece to control the irrigation of local farmland. A flood relief scheme is being planned for South West Bristol. (Merritt-FIRL)

UTILITARIAN LEISURE FOR BURNHAM-ON-SEA.

Surveyor, Vol 143, No 4263, p 9, February, 1974. 4 fig.

Descriptors: *Drainage systems, *Sewage treatment, *Sewers, Surface waters, Water storage, *Waste water treatment. Identifiers: *Great Britain(Burnham-on-Sea).

The proposed drainage scheme for Burnham-on-Sea Urban District Council (UDC) is described. The main drainage scheme is complete and is the first phase of a complete resewerage of the district. The entire plan includes a new regional sewage purification works and the abandonment of all existing untreated crude discharges to sea. Large areas of unused claypits were featured in the scheme to provide surface water storage capacity during tidelock conditions as an alternative to pumping arrangements. (Merritt-FIRL) w74-08262

COST EFFECTIVENESS IN SEWAGE TREAT-MENT.

Anglian Water Authority (England). Lincolnshire Sewage Div.

I. Ramsden. Surveyor, Vol 143, No 4263, p 28-29, February,

Descriptors: *Cost analysis, *Project planning, Optimum development plan, Project purposes, *Sewage treatment, Pipes, Personnel management, *Waste water treatment. Identifiers: *Great Britain(E. Kesteven).

The effects of the removal of slag media from filter beds at the East Kesteven Rural District Council (RDC) and subsequent replacement with plastic filter media are described. The capacity of the beds has been increased by at least two-fold. This example is used to stimulate cost effectiveness ideas for the sewage treatment industry. (Sandoski-FIRL)

RESULTS OF EXAMINATIONS OF HOSPITAL WASTE WATER (ERGEBNISSE DER UNTER-SUCHUNGEN VON KRANKENHAUSABWAES-SERNIN

New York (West Germany). Wasserhygiene Abteilung. For primary bibliographic entry see Field 5B. W74-08286

W /4-08286

ENVIRONMENTAL RESEARCH IN 1973--AN-NUAL REPORT. National Environmental Research Center, Cincinnati, Ohio.

For primary bibliographic entry see Field 5G. W74-08309

PROCESS KINETICS FOR DENITRIFICATION, Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering. W. K. Johnson

Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA4, p 623-634, August, 1972. 3 fig, 1 tab, 29 ref.

Descriptors: *Sewage treatment, *Activated sludge, *Denitrification, Carbon filters, Environmental sanitation, Sanitary engineering, Sewage bacteria, Water quality, Water pollution sources, *Waste water treatment, *Kinetics, *Biological treatment.

Kinetic equations for biological growth, substrate utilization, and oxygen uptake with the activated sludge process may be modified and used to describe a denitrification process. A basis difference between the processes is that the dependency of variables is interchanged. For denitrification the oxygen equivalent from the nitrates is the independent variable and the substrate supplied is a dependent variable. Coefficients used in the kinetic equations for denitrification are not well defined as yet but will differ from activated sludge particularly due to the lower yield characteristics of the denitrification process. Experimental data support the validity of the equations as presented. The rate of nitrate reduction is shown to be a linear

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function of the sludge loading rate, and the ratio of substrate applied to nitrate reduced BOD/N was found to be essentially constant over a wide range of sludge loadings. The exact magnitude of the BOD/N ratio is a function of the yield characteristics of the substrate and the yield characteristics of the biological treatment system employed. When the substrate or carbon source must proyect. When the substrate of carbon source must be purchased process yields are particularly im-portant. (Skogerboe-Colorado State) W74-08320

MANUAL FOR CALCULATION OF CONVEN-TIONAL WATER TREATMENT COSTS, Control Systems Research, Inc., Arlington, Va. For primary bibliographic entry see Field 3A. W74-08333

DEVELOPMENT OF LARGE SPIRAL MEM-BRANE REVERSE OSMOSIS ELEMENTS FOR LOW-COST WATER PURIFICATION AND RECLAMATION,

Gulf General Atomic Co., San Diego, Calif. For primary bibliographic entry see Field 3A. W74-08338

DEFINITION OF REVERSE OSMOSIS PUMP REQUIREMENTS FOR SPACE VEHICLE REQUIREMENTS.

McDonnell Douglas Astronautics Co., West, Huntington Beach, Calif. For primary bibliographic entry see Field 8C. W74-08340

EVALUATION OF ION **EXCHANGE** PROCESSES FOR TREATMENT OF MINE DRAINAGE WATERS,

Burns and Roe, Inc., Paramus, N.J. B. J. Intorre, E. G. Kaup, J. L. Hartman, H. D. Feiler, and R. M. Szostak.

Available from the National Technical Informa-tion Service as PB-227 734/AS; \$5.50 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-92, January 1974. 183 p. 24 fig. 25 tab, 21 ref. OSW Contract 14-30-2691.

Descriptors: *Desalination process, *Pilot plants, *Ion exchange, *Waste water treatment, *Mine drainage, *Acid mine water. Identifiers: Desal process, Cost estimates.

Laboratory and pilot plant research work was conducted on a modified Desal, Sul-biSul, and conventional ion exchange processes to evaluate their performance on acid mine drainage feed waters. The study included process variables, analytical techniques, daily monitor of acid mine drainage source, and economics of potable water production. This work was carried out at the Acid Mine Drainage Demonstration Plant at Hawk Run, Pennsylvania. Disposal of wastes is explored briefly. (OSW) W74-08341

DEVELOPMENT OF A REVERSE OSMOSIS MODULE FOR WASH WATER RECYCLING IN

A SPACE ENVIRONMENT AT 165 DEG F, Environgenics Systems Co., El Monte, Calif. R. W. Lawrence, R. A. Tidball, and C. W. Saltonstall, Jr.

Available from the National Technical Information Service as PB-226 632/AS; \$3.00 in paper copy, \$1.45 in microfiche. Office of Saline Water Report INT-OSW-RDPR-74-905, January 3, 1974. 28 p. 3 fig. 4 tab. 3 ref. OSW Contract 14-30-3221.

Descriptors: *Reverse osmosis, *Membranes, Desalipation, "Membrane processes, "Separation techniques, Ion exchange, Permeability, Detergents, Water quality, Ureas, Activated carbon, Prototype tests, "Recycling," Waste water treatIdentifiers: Cellulose acetate blend membrane. *Wash water, Space application of reverse osmosis, High temperature resistant membranes, Reverse osmosis module, Laundry wastes, Lactic

A spiral wound module 1.5 dia. and 18 in. long containing 3.3ft2 of blend (cellulose di- and triacetate) membrane was evaluated at 300 psig in real laundry water for 17 days at 165 deg F using a series of 30, 0.9 and 0.2 micron clarification filters. The flux declined from 6.2 to 4.3 gfd in that period. Throughout the test period, the rejections of detergent, lactic acid, ionic species, and total dissolved solids were above 98% at product recoveries ranging from 50 to 86%. A prototype system processing 27 gal of wash water in 8 hrs or less and employing 8 of the 1.5 in. dia X 18 in. modules was constructed and tested. With the exception of urea, all of the criteria for the product quality were easily met. Although the urea concentration in the product was below 50 ppm, the feed concentration was less than the required 58 ppm because of the small quantity of urea in the home laundry water. A carbon column was included in the prototype to remove traces of detergent that cause foaming in the product. An ion exchange column was also included to insure that ammonia nitrogen would remain below 5 ppm, but shop testing indicates that this column is probably not required. The addition of urease enzyme to laundry water at 74 deg C (165 deg F) was shown to be a feasible method for reducing urea content. A large excess of urease enzyme in laundry wash water hydolyzed all the urea present in 5.5 hrs or less. A problem in this method is the rapid loss activity of the enzyme at 74 deg C and the consequent necessity for use of a large excess. (OSW) W74-08344

APPLICATIONS OF WASTE PROCESSING SYSTEMS FOR PRESSURIZED WATER REACTORS,

Westinghouse Electric Corp., Pittsburgh, Pa.

Westinghouse Electric Corp., Fitsburgh, F.S.
I. Garber, and W. Kearton.
IEEE Transactions on Power Apparatus and
Systems, Vol PAS-93, No 1, p 149-157, January-February, 1974. 6 fig, 6 tab, 11 ref.

Descriptors: *Waste treatment, Application methods, Radioactive wastes, *Recycling, Storage, Monitoring, *Radioactive waste disposal, *Waste water treatment, Waste storage. Identifiers: *Reactors.

The application of Waste Processing Systems in the Westinghouse Pressurized Water Reactor Plants is discussed. These systems employ the techniques of waste product concentration, long term storage, recycling, and radiation monitoring in order to implement the basic philosophy govern-ing radioactive releases established by national and international guidelines. (Sanoski-FIRL)

BITUMINOUS COAL - A SUBSTITUTE FOR ANTHRACITE FILTER MEDIA IN TWO-LAYER FILTRATION OF WATER, Central Public Health Engineering Research Inst.,

Nagpur (India). For primary bibliographic entry see Field 5F. W74-08350

VIRUS REMOVAL IN WASTE STABILISATION PONDS

Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering. M. Chaudhuri.

Indian Journal of Environmental Health, Vol 16, No 3, p 171-177, July 1973. 1 tab, 32 ref.

Descriptors: Reviews, Data collections, *Oxidation lagoons, *Treatment facilities, *Waste treatment, *Waste water treatment, *Viruses. Identifiers: *Virus removal.

A review of the published data indicates that waste stabilization ponds are effective in reducing the virus levels of raw waste water and treated effluents. Presence of algae and bacteria, chemical and organic contents of the pond water, detention time and temperature, and sunlight may play significant roles in the removal or inactivation of viruses. A shallow pond with a longer detection time may be more effective in reducing virus concentrations (Sandoski-FIRL)

SWEDISH TECHNIQUES TO COMBAT POLLU-

Vattenbyggnadsbyran Ltd., Stockholm (Sweden). E. Isgard, and I.. Ehrlen.

Effluent and Water Treatment Journal, Vol 14, No 2, p 97-101, February 1974. 4 ref.

Descriptors: *Sewage treatment. *Treatment facilities, Water pollution control, Methodology, Regulations, Environmental control, Sludge treatment, Filtration, Operations, Operating costs, Water reuse, *Waste water treatment. Identifiers: *Sweden.

The demand on sewage treatment has increased in Sweden due to the increased population and the problems of waste disposal and subsequent water pollution. To facilitate the fulfillment of requirements set by the authorities as a result of the new environmental protection regulations, the national government grants contributions to certain municipal treatment plants. As of July 1973, wastes from 94 percent of the people living in urban areas were treated in sewage treatment plants, those facilities using either biological treatment or both biological and chemical treatment (estimated at more than 50 percent by 1975). Different mechanical, biological, and chemical treatment methods used in Sweden, their operational results, sludge treatment processes, operating costs of facilities, and various filtration and reuse procedures are discussed. (Sandoski-FIRL) W74-08353

SOME USEFUL IDEAS ON WASTE WATER REDUCTION.

Western Electric Co., Inc., New York, N.Y. R. H. Haralson.

Plating, Vol 61, No 4, p 310-313, April 1974, 5 fig.

Descriptors: *Design criteria, *Waste treatment. *Waste water treatment, Cleaning, Zinc, Corro-

Identifiers: Rinsing, Fog spraying, *Zinc plating

The reduction of waste must be made major design criteria in process planning, with a minimum of dilution and expense being the primary premises governing the design. Exemplified herein is a zinc plating process which consists of cleaning the surface to be plated, depositing the zinc on the surface, and passivating the surface to increase corrosion resistance. These steps of cleaning, rinsing, and fog spraying are discussed. (Sandoski-FIRL) W74-08355

MODEL STUDIES ON REACTIONS OCCUR-RING IN OXIDATIONS OF LIGNIN WITH MOLECULAR OXYGEN IN ALKALINE

MEDIA, Vienna Univ. (Austria). Institut fuer Anorganische

For primary bibliographic entry see Field 5B. W74-08359

EXAMPLES OF SEWAGE SLUDGE INCINERA-TION IN THE UK,

I. C. Camp. The Institution of Civil Engineers, Vol 56, Part 1, p 49-62, February 1974. 4 fig., 4 tab, 6 ref.

Waste Treatment Processes—Group 5D

Descriptors: *Sludge treatment, *Sewage sludge, *Incineration, *Treatment facilities, Municipal wastes, Operating costs. Identifiers: *United Kingdom.

Multiple hearth, rotary hearth, and fluidized bed incinerators for sludge withdrawn from municipal sewage are described followed by an account of the installation now under construction for the Esher Urban District Council. Reference is made to similar schemes for the new City of Milton Keynes, the Royal Borough of Caernarvon, and the Borough of Banbury. The annual cost of incineration is shown to range from \$3.75 to \$12.50 (\$2.50 = 1L) per person served by the system, the amount being dependent on the size of the installa-tion and the hours run each day. (Sandoski-FIRL) W74-08364

SOLIDS SEPARATION FROM INDUSTRIAL WATERS AND EFFLUENTS: SCREENING AND

STRAINING, Brackett (F.W.) and Co., Ltd., Colchester (England)

Chemistry and Industry, No 2, p 50-52, Jan. 19, 1974. 3 fig, 13 ref.

Descriptors: Treatment facilities, Equipment, *Screens, *Sieves, Filters, Filtration, Pumps, Pumping, *Sewage treatment, Pipelines, Industrial wastes, Domestic wastes, Municipal wastes, *Separation techniques. Identifiers: *Strainers.

Screening (by gravity) is differentiated from straining (of pumped liquids in pipelines) by reference to the filtering force employed. Screens are classed into those having stationary or moving surfaces. The former include simple bar screens, rotary or semirotary raking screens, and travelling rake screens. Moving screen surfaces include travelling bands and rotary drums. All travelling screens are self-cleaning. According to the screening degree required, rotary units comprise largevolume water screens (e.g., for cooling water in power plants), sewage and effluent screens (e.g., at sewage works inlets or sea outfall pumping stations), and fine screens (e.g., for tertiary sewage treatment or raw reservoir water purification). Strainers are distinguished from screens by being always fully enclosed. Four basic strainer types in-clude the Y-type, the Sinlex basket, Duplex, and automatic motorized self-cleaning strainers, such as the Bracket Strain-O-Matic. Recent developments in the design, construction, and practical application of screens and strainers ared reviewed, and probable future developments are indicated.
(Brown-IPC) W74-08393

UTILIZATION OF INDUSTRIAL WASTES AND WASTE BY-PRODUCTS FOR PHOSPHORUS REMOVAL: AN INVENTORY AND ASSESS-MENT.

Environmental Protection Service, Ottawa (Ontario). P. J. A. Fowlie, and E. E. Shannon.

Environment Canada Research Program for Abatement of Municipal Pollution, Canada-On-tario Agreement on Great Lakes Water Quality, Research Report No. 6, June 1973. 87 p, 11 fig, 15 tab, 22 ref, 3 append. 72-3-5.

Descriptors: *Waste water treatment, *Industrial wastes, *Byproducts, *Sludge, *Phosphorus com-pounds, Chemical industry, *Canada, *Iron com-pounds, Effluents, Heavy metals, Hydrogen ion concentration, Activated sludge, Chemical oxygen demand, Sludge treatment, Incineration, Water reuse, Recirculated water, Sulfates, Identifiers: Pickle liquor, Ferrous sulfate, Ferric

sulfate, Dunnville(Ontario), Ontario, Quebec.

A survey of 141 Ontario and Quebec companies resulted in an inventory of waste products. Discharges of 48 factories were evaluated for phosphorus removal efficency in jar tests. Several wastes having varying degrees of usefulness as byproducts were identified, viz., pickle liquors, reclaimed ferrous sulfate heptahydrate, mill scale, spent mine acid, carbide lime, stack precipitator dusts, dross, red mud, and certain bag-house dusts and slags. Problems of waste reuse are discussed, and estimates are made of available quantities and treatable waste water volumes. Effects of pickle liquor additions on a bench-scale activated sludge process were investigated. A liquor dosage of 20 g/liter (as Fe) gave effluent P levels consistently below 1 mg/liter for influent P levels as high as 9.3 mg/liter. The pickle liquor did not affect COD removal, effluent pH or effluent heavy metal content. Nearly all heavy metals added with the liquor accumulated in the mixed liquor solids. When ferric sulfate from sludge incinerator ash was evaluated for P removal on a pilot scale, a dosage slightly over 15 mg/liter (as Fe) gave ef-fluent P levels below 1 mg/liter. Heavy metals again accumulated in the sludge and were not carried over into the effluent. Full-scale P removal studies at a wastewater treatment plant in Dunville, Ontario, using pickle liquor, were monitored for heavy metal levels in various plant streams. Except for Fe, no increase in metal transport occurred between baseline and pickle liquor addition. Significant increases occurred, however, in all metal concentrations in the mixed liquor, aero-bic digester, and waste sludge solids. (Brown-IPC)

NUTRIENT CONTROL IN SEWAGE LAGOONS. Pollutech Pollution Advisory Services Ltd., Oakville (Ontario).

Environment Canada, Research Program for Abatement of Municipal Pollution, Canada-On-tario Agreement on Great Lakes Water Quality, Research Report No. 8, (1973). 56 p, 27 fig, 2 tab, 7 ref, 3 append. 72-5-12.

Descriptors: *Phosphorus compounds, *Waste water treatment, *Aerated lagoons, *Phosphates, Aluminum, Iron compounds, Chemical precipitation, Solubility, *Simulation analysis, Computers, Effluents, Pollutants, Carbon, Temperature, Hydrogen ion concentration, Canada, Seasonal. Identifiers: *Aluminum sulfate, *Ferric chloride, Shelbourne(Ontario).

Phosphorus (P) removal from waste waters by means of alum or ferric chloride additions to lagoon influents and subsequent precipitation of phosphates was studied, including design and operating problems, and effects of seasonal temperature variations and of pH. Lagoon conditions were simulated by two techniques. (1) Laboratoryscale simulators operating under controlled temperature and loading were seeded with bottom deposits and filled with effluent from full-scale lagoons in Shelbourne, Ontario. (2) A computer model was developed to simulate removal of soluble phosphates by alum precipitation. During periods of low dissolved oxygen, both P and C were resolubilized from bottom deposits in the full-scale control and the laboratory control lagoons. Resolubilization of P depended less on temperature and lagoon maturity than did the resolubilization of C. The P resolubilization could be controlled by continued alum addition to the laboratory lagoon; in the full-scale lagoon, the alum distribution was not sufficiently uniform to achieve such control. More extensive P resolubilization may occur at higher temperatures, but pH was not a governing factor. The computer model did not predict the P concentrations observed experimentally and would require extensive improvements not warranted at this time. Further studies are recommended. (Brown-IPC)

DESIGN AND PERFORMANCE CRITERIA FOR SETTLING TANKS FOR THE REMOVAL OF PHYSICAL-CHEMICAL FLOCS,

Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering. G. W. Heinke.

Environment Canada, Research Program for Abatement of Municipal Pollution, Canada-On-tario Agreement on Great Lakes Water Quality. Vol 1, Research Report No. 10, March 1973. 82 p. 20 fig. 12 tab. 44 ref. 2 append. 72-5-7.

Descriptors: *Treatment facilities, *Waste water treatment. *Floculation. *Sedimentation rates, Aluminum, Iron compounds. *Lime, Sulfates, Sludge treatment, Recycling, Polymers, Sewage treatment, Effluents, Temperature.

Identifiers: *Ferric chloride, *Aluminum sulfate, Clarifiers, Aluminum compounds,

About 50 long-tube and short-tube laboratory settling tests were conducted on Humber sewage treatment plant raw wastewater with and without additions of alum, ferric chloride, lime, and polymers, supplemented by full-scale plant studies at Windsor and Sarnia for 8 and 1 month, respectively. Results were analyzed in terms of effluent solids and BOD, overflow rate, and detention time as functions of type and dosage of chemicals. All three inorganic additives increased the settling rate of solids. Lime gave the fastest, alum the slowest settling flocs. Addition of polymer and recycling of sludge further increased the settling rate. A scale-up factor of 2.0 was determined for the Sarnia clarifiers, indicating that laboratory settling or overflow rates must be halved for plant design to allow for the effects of turbulence and other varia-bles in the clarifier. Variations in plant overflow rates between 300 and 600 gal/day/sq ft (or 15-30 cu m/sq m/day) affected the effluent quality only slightly. This may hold true at higher overflow rates, but needs to be confirmed by plant trials. (Brown-IPC)

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES. Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering. For primary bibliographic entry see Field 5E. W74-08397

TO ESTABLISH VIABLE METHODS OF MAINTAINING WASTE TREATMENT FACILITY EF-FICIENCIES WITH REFERENCE TO FLOW VARIATIONS.

Maclaren (James F.) Ltd., Willowdale (Ontario). Environment Canada, Research Program for Abatement of Municipal Pollution, Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 11, (1973). 91 p, 35 fig. 13 ref, 1 append. 72-5-10.

Descriptors: *Sewage treatment, *Treatment facilities. *Flow, *Equalizing reservoirs, *Hydraulic design, Hydraulic engineering, *Dimensional analysis, Dimensions, Aeration, Mathematical studies, Equations, Seasonal, Diur-nal, Distribution patterns, Time, Variability, Design, Operation and maintenance.

Equalization of sewage flow variations has three major benefits: reduced unit size, more stable operation, and reduced bypassing of influent. A methodology for dimensioning of equalization facilities was developed, using actual flow data from a treatment plant of 40-50 MIGD (million Imperial gallons per day) capacity to account for diurnal and seasonal variations in sewage flow. Revised design criteria were established with the aid of basic concepts including modified hydraulic characteristics of equalized sewage flow. The method was then applied to a plant similar in size to that studied under equalized and varying flow conditions. Despite the conservative approach used (especially in dimensioning of aeration tanks

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and final clarifiers), savings in capital costs seemed realizable from the installation of equalization facilities. The need for further investigations and more rigorous evaluation of the initial methodologies is pointed out. (Brown-IPC)

INTEGRATION OF PHYSICO-CHEMICAL AND BIOLOGICAL WASTE-WATER TREATMENT PROCESSES.

Waterloo Univ. (Ontario). Research Inst.

Waterboo Univ. (Ontailo), Assessin Inst.
W. R. Dryman, and D. H. Haycock.
Environment Canada, Research Program for
Abatement of Municipal Pollution, Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 7, (1973). 112 p, 23 fig, 36 tab. 7 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Phosphorus compounds, *Pilot plants, Aluminum, *Silica, *Aeration, Effluents, Phosphorus, Sulfates, Hydraulic design, Treatment facilities.

Identifiers: *Aluminum sulfate, Activated silica.

Alum was added to an activated sludge process for phosphorus removal, and the effects on the opera-tion and performance of the system were investigated, using two parallel pilot plants with design capacities of 2 million gal/day (mgd) at various hydraulic loadings (1.5, 2.0, and 2.5 mgd). One plant was run as a control, while 100 mg/liter of alum and 4 mg/liter of activated silica were added to the aeration tank of the other for removal of P Additional laboratory studies were performed with continuous-flow, bench-scale models to gain information unobtainable from the pilot plants. (Brown-W74-08399

CHEMICAL DOSAGE CONTROL FOR PHOSPHORUS REMOVAL.

Pollutech Pollution Advisory Services Ltd., Oakville (Ontario).

vine (Ontario). Environment Canada, Research Program for Abatement of Municipal Pollution, Canada-On-tario Agreement on Great Lakes Water Quality, Research Report No. 4, March 1973. 80 p, 44 fig, 7 tab. 7 ref. 72-5-11.

Descriptors: *Sewage treatment, *Municipal wastes, *Sewage effluents, *Phosphorus compounds, *Chemical precipitation, *Chemcontrol, Rates of application, Economics, *Monitoring, Automatic control, Aeration, Aluminum, Correlation analysis, Phosphorus, Mixing, Testing, Sampling, Solubility, Chemicals, Cost-benefit analysis, Kinetics, *Waste water treatment.
Identifiers: Aluminum hydroxide, Aluminum

sulfate. Aluminum compounds. Jar tests.

Jar tests and full-scale studies were conducted to determine whether a simple monitoring procedure could control the addition of chemicals in municipal waste treatment plants, whether proportional control of chemical dosing would be economical, to identify those specific parameters that could be monitored for dosage control, and where such controls should be advantageously located. The chemical dosage required for a 1 mg/liter phosphorus residual could be predicted if iar tests were repeated on the same waste sample. Savings in chemical consumption of 30-40% might be achieved if a controller capable of measuring chemical requirements to the same accuracy as the jar test could be developed. The full-scale studies revealed a reasonable correlation between final effluent P and soluble P in the aeration tank effluent after chemical addition; limiting the tank effluent's soluble P concentration to 0.2 mg/liter would be expected to give 1 mg/liter of P residual in the final effluent 80% of the time. The observed P removal was postulated to occur in 3 distinct steps, the majority being removed in the aeration tank. Addition of alum to mixed liquor resulted in immediate precipitation of a fairly constant percentage of

soluble P. almost independently of the chemical dosing rate. Increasing the dosing rate caused an eventual decrease in the amount of P removed. Automatic control of chemical addition, based on final effluent P is technically feasible, but such a controller would have to be heavily damped. In the treatment plant, a sudden increase in the dosing rate did not immediately affect the aluminum hydroxide concentration. The latter increased slowly, resulting in an eventual improvement of final effluent quality. The system was thus shown to be strongly self-regulatory. Hence adequate control might be achieved by manual adjustment of dosing rates a few times daily after P measure-ments in the final effluent. (Brown-IPC) W74-08400

RECENT DEVELOPMENTS IN TREATMENT OF PAPERMAKING EFFLUENTS IN FRANCE (DEVELOPPEMENTS RECENTS DU TRAITE-MENT DES EFFLUENTS DE PAPETERIE EN

P. Treille.

La Papeterie, Vol 95, No 6, p 440-446, 449, June 1973. 9 fig, 4 tab.

Descriptors: *Treatment facilities, Equipment, *Pulp wastes, *Waste water treatment, *Sedimentation, *Flocculation, *Flotation, Pulp and paper industry, Europe, Fibers(Plant), Ef-fluents, Industrial wastes, Organic loading, Dis-solved solids, Suspended solids, Waste solved solids, Suspended solids, Waste water(Pollution), Water pollution control, Pollution abatement.

Identifiers: *France, Savealls, Fiber recovery, Paper machines, White water.

Three relatively new types of effluent-treatment equipment are described. The 'Turbocirculator' is a circulatory rotor device designed specifically for use in sedimentation units of paper mills. A new flotation-type saveall is geared to handle effluents that are low in mineral and high in organic loadings, as well as to fiber and fines recovery from paper machine white waters. A new electroflocculator makes use of an electric field to flocculate suspended and dissolved solids. Three case histories are cited to illustrate the results ob tained by one or more of these systems in pulp and paper mill waste water treatment plants. (Speckhard-IPC) W74-08402

PULP, PAPER, AND BOARD IN THE EN-VIRONMENT -- PART 8: ENVIRONMENTAL PROBLEMS OF THE WEST GERMAN PULP, PAPER, AND BOARD INDUSTRY For primary bibliographic entry see Field 5G. W74-08405

PULP, PAPER, AND BOARD IN THE EN-VIRONMENT -- PART 9. POLLUTION ABATE-MENT IN THE FINNISH PULP AND PAPER IN-

For primary bibliographic entry see Field 5G. W74-08406

REPLACEMENT OF THE ANTHRACITE SUBLAYER IN ANION-EXCHANGE FILTERS
OF WATER PURIFICATION EQUIPMENT
(ZAMENA ANTRATSITOVOGO PODSLOYA V
ANIONITOVYKH FIL'TRAKH VODOOCHIST-NYKH USTANOVOK), Ukrainskii Nauchno-Issledovatelskii Institut Bu-

magi, Kiev. V. V. Mitkova, Kh. M. Pinskaya, L. M. Vaisman,

A. I. Ivanov, and N. I. Vanina. Bumazhnaya Promyshlennost', No 11, p 13, Nov.

Descriptors: *Waste water treatment, Pulp wastes, Water treatment, *Industrial water, Pulp and paper industry, *Ion exchange, *Electrical conductance, Water quality, *Water purification, Desalination Carbon Conductors Conductivity Cation exchange, Anion exchange, Coals.

Identifiers: *USSR(Kommunar Paper Capacitor papers, Electrical papers, Paper mills,

The process water needed for the manufacture of capacitor papers must be particularly pure, notably free of electroconductive contaminants. At the Kommunar Paper Mill (USSR), water is demineralized in ion-exchangers filled with cation-and anion-exchange resins. The treated water was, however, found to contain carbon particles originating from the anthracite that is used as a substrate layer in the second-stage anionic resin filters. Replacement of this layer by an unspecified new material reduced the number of electroconductive particles embedded in the manufactured paper from ca. 32 to 11-13/sq m. The feasibility of ion-exchange without any substrate layers, as practiced in East German paper mills, should be researched for further improvements in the water supply quality. (Stapinski-IPC) W74-08407

ROLE OF ULTRAFILTRATION IN INDUSTRI-AL EFFLUENT PROBLEMS

Dorr-Oliver, Ltd., Croydon (England).

Chemistry and Industry, No 2, p 56-58, Jan. 19, 1974. 2 fig.

Descriptors: *Reverse osmosis. *Filtration. *Membrane processes, *Separation techniques, *Dewatering, Water treatment, *Waste water treatment, Paints, Dairy industry, Activated sludge, Industrial wastes, Optimization, Electrophoresis, Polymers, Pressure, Temperature, Porosity, Membranes, Permeability, Solvents, Effluents, Proteins. Identifiers: *Ultrafiltration.

The theoretical principle, operating variables, and optimized design of ultrafiltration systems for arious applications are reviewed. Ultrafiltration is a pressure-activated process using semipermea-ble polymeric membranes to separate molecular or colloidal materials dissolved or suspended in a liquid phase according to molecular weight in the range of 5000 to 100,000. The first asymmetric membranes were produced by Loeb and Sou-rirajan at U.C.L.A. in the early 1960's. These membranes comprise an ultrathin (0.5-1.5 micrometer) surface layer of fine pore texture supported on a more porous thicker (5-10 mil) layer. Theoretical flux rates of 100-500 gal/sq ft/day have not been approached by commercial isotropic plastic films which are ca. 13 micrometer thick and can process only 0.1-1.0 gal/sq ft/day. Fouling of membrane surfaces by gel formation in the retained solute offers high resistance to flow. Membrane permeation rates are also a function of operating pressure, temperature, solids concentra-tion, fluid viscosity, hydrophilic nature of sol-vents, and other variables. Process developments follow three different approaches: creation of a reversible hydrodynamic situation; periodic regeneration of membranes; and pretreatment of the feed to inhibit film formation. Industrial appli-cations of ultrafilters include electrophoretic painting, lactose separation and protein concentra-tion from dairy effluents, and effluent dewatering in combination with activated sludge treatment. (Brown-IPC) W74-08408

TREATMENT SYSTEM HANDLES FLEXO INK AND STARCH WASTE IN SINGLE OPERATION,

Japan Corrugated Board and Box Inst., Tokyo. T. Sugaya.

Paperboard Packaging, Vol 58, No 12, p 28, 30, 32-33, Dec. 1973. 3 tab, 4 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Water conservation, *Pulp wastes,

*Recirculated water, *Industrial wastes, Chemical recipitation, Coagulation, Dewatering, Sludge treatment, Calcium hydroxide, Iron compounds, Chlorides, Filtration, Coagulation, Recycling, Adhesives, Carbohydrates, Foreign research, Biochemical oxygen demand, Suspended solids, Chemical oxygen demand, Sedimentation rates,

Identifiers: Printing inks, Flexographic inks, Printing industry, Graphic arts, Corrugated boards, Starch, Corrugating adhesives, Starch paste, Wash water, Ferric chloride, Japan, Printing machines, Paperboards, Converting industry.

Waste waters from the manufacture of printed corrugated board contain residues of flexographic inks and starch paste. These pollutants are removed by a newly developed Japanese process.

The mixed wastes are treated first with ferric chloride and calcium hydroxide in a mixing tank and then pumped to a settling tank. After rapid precipitation, the sludge is removed from the tank bottom and transferred to a dehydration tank where it is treated with coagulants and then dewatered by filtration. The clarified effluent from the settling tank is reused as wash water for the flexographic printing presses and as makeup water for the preparation of fresh corrugating adhesive. The treatment system removes 82% of the suspended solids, 96.4% of the BOD, and 97% of COD from the combined starch/ink waste waters. Treatment costs for a typical corrugated board and box factory are indicated. (Witt-IPC) W74-08409

PROCESS OF PHYSICAL-CHEMICAL PURIFICATION FOR WASTE WATERS FROM PAPER AND BOARD MILLS (PROCEDE DE NETTOYAGE CHIMICO-PHYSIQUE POUR LES RESTES D'EAUX USEES DES FABRIQUES DE PAPIER ET CARTON),

B. Morgeli. La Papeterie, Vol 95, No 6, p 479-482, June 1973. 5 fig. 2 tab. 5 ref.

Descriptors: *Pulp wastes, *Treatment facilities, *Waste water treatment, *Water pollution control, Flocculation, Filtration, Oxidation, Ozone, Adsorption, Activated carbon, Waste sorption, Activated carbon, Waste water(Pollution), Pollutants, Discharge(Water), Pulp and paper industry, Effluents, Industrial

Identifiers: Board(Paperboard) mills

Discussed is the use of various treatments combining flocculation, filtration, ozonization-oxidation, and activated carbon adsorption for the removal of pollutants from paper and paperboard mill waste waters prior to their discharge. (Speckhard-IPC)

PURIFICATION OF SULFITE MILL EF-FLUENTS FROM LIGNOSULFONATES (OCHISTKA PROMSTOKOV SULFITNO-TSEL-LYULOZNOGO PROIZVODSTVA OT LIGNOSUL'FONATOV),
Moscow State Univ. (USSR).
O. I. Luk'yanova, E. S. Solov'eva, N. F.
Pilinskaya, and P. A. Rebinder.
Bumazhnaya Promyshlennost', No 11, p 19-20,

Descriptors: *Lignins, *Sulfonates, Descriptors: "Sufficiency, "Sufficiency, "Sufficiency, Water pollution control, "Waste water treatment, "Pulp wastes, "Adsorption, Calcium hydroxide, Magnesium hydroxide, "Chemical precipitation, Sedimentation rates, Pulp and paper industry, Effluents, Chemicals, Organic loading, Waters," (Sufficiency, Chemicals, Organic loading, Waters, Waters, 1997). Water pollution sources, Incineration, Oxides. Identifiers: Chemical recovery, Calcium oxide, Magnesium oxide, Specific surface, Surface area,

Adsorbents, Lignosulfonates, Lignosulfonic

Spent sulfite pulping liquors and other sulfite mill effluents can be freed simply and economically of

lignosulfonate salts (LS) by adsorption on Mg or Ca hydroxides. During in situ formation of these hydroxides, upon addition of MgO or CaO to the aqueous effluent, their surface area is greatly inaqueous erituent, their shartace area is greatly increased, up to 1000 sq m/g, so that they can sorb up to 3-4 g of LS per g of anhydrous oxide added. However, monovalent cation salts of lignosulfonic acids (Na and ammonium LS) adsorb poorly and should first be converted to Al or Fe salts. In practice of the salts in practice. tical trial runs, good results were achieved with relatively small additions of MgO, depending on the concentration of LS in solution. Thus, 3-4% of MgO (based on spent sulfite liquor weight) sorbed most of the LS from 2% solutions and 90% of the LS from 6-7% solutions. A slight excess of oxide over the theoretically required dosage is recom-mended to accelerate sedimentation of the resulting precipitate from which the oxide can then be recovered by calcination at 500-600C. This thermal treatment should again increase the specific surface of the oxides and hence their sorption capacity. (Stapinski-IPC) W74-08412

AERATION OF EFFLUENTS IN AERATION TANKS (AERATSIYA STOCHNYKH VOD V AEROTENKAKH-VYTESNITELYAKH),

Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost (USSR).

V. G. Zav'yalov, A. V. Uglitskikh. Zav'yalov, L. I. Shmidt, V. M. Khazak, and

Bumazhnaya Promyshlennost', No 11, p 17-18, Nov 1973. 2 fig.

Descriptors: *Equipment, *Aeration, *Waste water treatment, *Pulp wastes, *Treatment facilities, Pulp and paper industry, Bubbles, Oxygen, Waste water(Pollution), Water pollution control, Pollution abatement, Foreign research, Efficien-

Identifiers: *USSR Solikamsk Pulp and Paper

An effective pneumo-mechanical aeration system developed in the USSR for use in pulp and paper mill effluent aeration tanks is expected to become commercially operative in 1975. In the mean time, a mechanical device for improved utilization of oxygen (beyond the 4-10% efficiency of presently installed aerator tubes or plates) has been tried out at the Solikamsk Pulp and Paper Mill (USSR). The theoretical principle involved is prolonged contact of air bubbles with the waste water to be treated. This is achieved by posing mechanical obstacles in the path of rising air bubbles. The perforated plates and tubes developed and installed for this purpose are described in some detail. In compara-tive experiments, these perforated aerators almost doubled the biological purification efficiency (in terms of the ratio of COD to aeration time) compared to plain tubes and plates. (Stapinski-IPC) W74-08413

POLLUTION ABATEMENT AT THE VENIZEL MILL OF LA ROCHETTE-CENPA (LUTTE ANTI-POLLUTION A L'USINE DE VENIZEL DE LA ROCHETTE-CENPA).

D. Ladmiral. La Papeterie, Vol 95, No 6, p 469-470, 473, June 1973. 3 illus.

Descriptors: *Pulp wastes, *Sulfite liquors, *Pollution abatement, *Waste water treatment, Water pollution control, *Treatment facilities, Europe, Pulp and paper industry, Waste water treatment, Aerated lagoons, Effluents, Incineration,

Evaporation. Identifiers: *France, Clarifiers.

A French sulfite pulp and paper mill has switched from calcium-base sulfite liquor to the ammonium sulfite semichemical process, partly for ecological reasons, and has installed equipment and processes for evaporation and combustion of the spent cooking liquor, as well as a clarifier and three aeration lagoons for effluent treatment. The facilities are described. (Speckhard-IPC)

W74-08416

OPERATION OF PILOT PLANT EQUIPMENT FOR PURIFICATION OF EFFLUENTS FROM THE STEFAN KIRADZHIEV PULP AND PAPER MILL IN NOVI KRICHIM (SYZLAVANE REZHIM NA RABOTA NA POLUPROIZVODST-VENA PRECHISTVATELNA STANTSIYA ZA PROMISHLENI OTPADYCHNI V ODI OT KTSKH 'STEFAN KIRADZHIEV' GR. NOVI KRICHIM),

M. Paskaley, and N. Markova. Tseluloza i Khartiya (Sofia), Vol 4, No 5, p 30-31, Sept-Oct 1973, 2 tab, 3 ref.

Descriptors: *Pulp and paper industry, Europe. *Pulp wastes, *Waste water treatment, *Treatment facilities, *Pilot plants, Aeration, Sedimentation, Suspended solids, Biological treatment, Biochemical oxygen demand, Effluents, Water pollution treatment, Microorganisms, Biodegradation, Nutrients, Nitrogen compounds, Phosphorus compounds, Temperature, Neutralization, Sulfur compounds, Oxidation. Identifiers: *Bulgaria.

A Bulgarian pulp and paper mill installed a pilot plant with a flow capacity of 15 liter per sec for effluent treatment prior to construction of a full-scale plant with 876 liter/sec capacity. Effluents are first mechanically freed of suspended solids, neutralized to pH 7.05-7.10, subjected to forced air for removal of sulfur compounds, and then treated with nutrients (to give a 5-day BOD:N:P ratio of 100.5:1) before passing to an aeration tank for biological purification. Of the two process variants tried, both developed in the USSR, the continuous method was found to be superior to the multistage method. It provided for continual spontaneous increase of microorganisms and gave a corresponding increase in purification efficiency even in winter at 10C effluent temperatures. After three months of pilot plant operation. a 5-day BOD reduction of up to 87.8% was achieved. (Stapinski-W74-08417

SYSTEM OPTIMIZATION FOR PULP AND APER INDUSTRIAL WASTEWATER TREAT-MENT DESIGN.

Texas A and M Univ., College Station. Dept. of In-

dustrial Engineering.
C. S. Shih, and P. Krishnan.
Water Research, Vol 7, No 12, p 1805-1820, Dec 1973, 8 fig. 11 tab. 13 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Optimization. Treatment facilities. *Dynamic programming, Theoretical analysis. *Decision making, Methodology, Economic justification, Planning, *Systems analysis, Costbenefit analysis, Cost comparisons, Pollution abatement, Pulp and paper industry, Management.

The rapid diversification of newly developed waste water treatment processes and facilities for combating ever-increasing industrial pollution loads necessitates a systems approach to the choice of the most suitable and economical among various alternatives. An optimization procedure is presented which integrates dynamic programming techniques into existing process design principles to permit decisions on the best combination of operations in a multistage system. The procedure, which makes use of 'decision inversion' and of specially developed practical cost functions, is il-lustrated by a numerical example of a typical pulp and paper mill effluent treatment installation.
(Witt-IPC) W74-08418

EXAMPLES OF THE USE OF THE 'SECLAR' DECANTER IN TREATING PAPER INDUSTRY EFFLUENTS (EXEMPLES D'APPLICATION DU

Group 5D—Waste Treatment Processes

DECANTEUR 'SECLAR' AU TRAITEMENT D'EFFLUENTS DE L'INDUSTRIE PAPETIERE), Societe Alsthom, Paris (France). Techniques des

M. Delachanal, and P. Lejeune. La Papeterie, Vol 95, No 6, p 450-452, 455-457,

June 1973. 4 fig.

Descriptors: *Activated sludge, *Pulp wastes, *Biological treatment, Treatment facilities,
*Waste water treatment, Water pollution treatment, Pollution abatement, Equipment, Europe, Pulp and paper industry. Identifiers: *France, *Seclar clarifier, Clarifiers.

Three examples of effluent treatment installations using the 'Seclar' sedimentation saveall are described, viz., at Saint-Vallier (Papeterie de la Ferrandiniere), at Wardrecques (Cartonnerie de Gondarnennes), and at Fos-sur-Mer (Etablissement Voisin et Pascal) in France. Solids coagulation and flocculation in these units is achieved by additions of aluminum sulfate, lime, and anionic polyelectrolytes. Although BOD and COD reductions vary from case to case, solids removals of the order of 93-99% are reported. (Speckhard-IPC) W74-08419

WASTE WATER PROBLEMS OF THE TEX-TILE INDUSTRY. PART I. OXYGEN DEMAND OF PRINTING PASTE THICKENERS. (PROBLEMI INERENTI LE ACQUE DI SCAR-ICO NELL'INDUSTRIA TESSILE. IO. LA DO-MANDA DI OSSIGENO DI ADDENSANTI DA

Stazione Sperimentale per la Cellulosa, Carta e Fibre Tessili Vegetali ed Artificiali, Milan (Italy). Laboratorio Analisi delle Acque.

For primary bibliographic entry see Field 5B.

W74-08421

A 6000 GALLON/TON FINE PAPER MACHINE WATER SYSTEM.

American-Israeli Paper Mills Ltd., Hadera (Israel). I. Rakosh

p 63-66, Technical Paper T69-72, March 1974, 3 fig, 2 tab.

Descriptors: *Water reuse, Freshwater. *Reclaimed water, *Pulp and paper industry, Water pollution, Activated sludge, Effluents, Pulp wastes, Water conservation, Suspended solids, Biochemical oxygen demand, Water consumption(Except consumptive use), Activated sludge, Pilot plants, Fibers(Plant), Recycling. Identifiers: Paper machines, White water, Deinking, Savealls, Waste paper, *Israel.

Fresh water consumption on a fine paper machine at American-Israeli Paper Mills Ltd. (Hadera, Israel) was reduced over a 10 year period from 35,000 to 6,000 gallons per ton of paper produced. Modifications to the white water systems. savealls, and press section flows to achieve this savings are described. Daily calculations are made of water consumption and effluent flows, and irregular losses are traced and coded. Machine effluent was reduced by 87%, suspended solids and BOD were reduced by 60%. Fiber savings are 500 tons per year. Part of the machine effluent is used as wash water in the deinking plant. An activated sludge process is under pilot plant study. (Buchanan-IPC) W74-08424

PERMEABILITY OF HIGH ASH PAPERMILL SLUDGE, Michigan State Univ., East Lansing. Dept. of Civil

Engineering.

O. B. Andersland, and R. W. Laza

O. D. Andersand, and K. W. Laza.
Journal of the Sanitary Engineering Division,
American Society of Civil Engineers, Vol 98, No
SA6, p 927-936, Dec 1972. 5 fig, 2 tab, 17 ref.

Descriptors: *Sludge treatment, *Pulp wastes, *Bubbles, *Gases, *Deacration, *Hydraulic properties, *Permeability, Sludge, Pressure, Mercury. Waste treatment.

The permeability of a secondary fiber mill sludge was greatly decreased by trapped gas bubbles. The threshold hydraulic gradient required to initiate flow dropped with increased back pressures and approached zero when the pressure sufficed to dissolve the gas. Pretreatment with HgO and vacuum removed the bubbles effectively. In the absence of gas bubbles, sludge permeability increased with increased organic content, particularly at low solids contents. The addition of 10% lime or fly ash improved the permeability.
(Buchanan-IPC) W74-08425

VOITH CIRCULAR CLARIFYING BASIN FOR BAIERSBRONN (VOITH-RUNDKLAERBECKEN FUER BAIERSBRONN). Der Papiermacher, Vol 22, No 6, p 92, June 9,

1973. 1 fig.

Descriptors: *Waste water treatment, *Pulp wastes, *Equipment, Filtration, Europe, Pulp and paper industry, Industrial wastes, Pollution abate-

ment, Filters, Screens.
Identifiers: *West Germany, Fiber recovery,
White water, Paper machines, Board(Paperboard) mills. Savealls.

The design, constructional, and operational characteristics of a white water saveall made by the J. M. Voith Co. (Austria) are described, along with its use in fine fiber recovery from paper machine white waters and for waste water purification at the paperboard mill of the Deutsche Zundholzfabriken GmbH at Baiersbronn, West Germany. The basin has a diameter of 15 m, an average water level of 4m, and a capacity of ca. 770 cu m. It is designed to process 5000 liters of waste water per minute. (Speckhard-IPC) W74-08427

POLLUTION OF THE DRAMMENS RIVER BY THE WOOD-PROCESSING INDUSTRY (TREFOREDLINGSINDUSTRIENS TIL DRAMMENSVASSDRAGET). For primary bibliographic entry see Field 5B. W74-08428

SOME RESULTS OF WATER PURIFICATION VISCOSE RAYON FACTORIES (NEKOTORYE ITOGI RABOTY VODOOCHIST NYKH SOORUZHENNII VISKOZNYKH VOLOKON), PREDPRIVATII

Vsesoyuznyi Nauchno-Issledovatelskii Institut Iskusstvennogo Volokna, Leningrad (USSR). Leningradskii Filial.

E. S. Shapiro, V. A. Klyueva, A. Z. Ioffe, and M. I. Lokhnina

Khimicheskie Volokna, Vol 14, No 4, p 54-55,

Descriptors: *Textiles, *Industrial wastes, *Waste water water treatment, Foreign countries, Expenditures, *Costs, Economics, Pollution abatement, Water pollution control, Chemicals, Capital costs, Operating costs, Treatment facili-Identifiers: Viscose rayon, *USSR.

The economic aspects of water purification at twelve Soviet viscose rayon factories are discussed. Antipollution costs varied widely among installations. Capital expenditures were lowest in plants having minimal or incomplete treatment facilities, or which were about to start operation. A significant proportion of purification costs was due to purchase of chemical reagents. W74-08429

CENTRIFUGAL DEWATERING OF SECONDA-

RY WASTE SLUDGES,
Organization Pennwalt Ltd. Camberley (England). I Ford

Chemistry and Industry, No 2, p 58-61, Jan. 19, 1974. 7 fig, 1 ref.

Descriptors: *Centrifugation, *Equipment, *Treatment facilities, *Sludge treatment, *Dewatering, *Waste water treatment, Industrial wastes, Operation and maintenance, Co Capital cost, Operating cost. Identifiers: Centrifuges, SludgePak centrifuge.

The design, operation, and practical performance, including cost, of the 'SludgePak' imperforate bowl knife centrifuge are discussed, particularly with regard to the dewatering of sewage works secondary sludges, industrial aerobic sludges, and water treatment alum sludges. All of these sludges are light and slimy and difficult to dewater by filare ignit and silmy and difficult to dewater by fil-tration techniques. Cost savings are attributed partly to the unit's operation without need for polyelectrolyte additives. (Brown-IPC) W74-08431

MEDIA FILTRATION IN EFFLUENT AND WASTE WATER TREATMENT.

D. B. Purchas.

Chemistry and Industry, No 2, p 53-55, Jan. 19, 1974. 5 tab, 1 diag, 8 ref.

Descriptors: *Filters, *Filtration, *Treatment facilities, *Equipment, *Waste water treatment, *Water treatment, Separation techniques, Dewatering, Suspended solids, Centrifugation, Ef-

Mechanical solids-liquid separation techniques include filtration and sedimentation as major subgroups. Filters comprise essentially two parts, the filter medium and the supporting hardware. Media can be classed according to their rigidity, porosity, and relative performance. In addition, the selection of the right filter for a given application must also consider pretreatment methods, such as chemical dosing, heating, freeze/thaw, ultrasonic, ionized radiation, and prethickening. Waste water and effluent filtration comprises two broad categories: clarification (removal of small amounts of solids from large volumes of liquid, e.g., by sand filters) and cake filtration (recovery of large amounts of solids from concentrated slurries, e.g., by filter presses). Modern trends in filter design are outlined, such as the Immedium upward-flow, precoat pressure (swimming pool), Granger reversible, and vacuum filters. The Johnson-Progress X-press, the Soviet FPKAM filter, the Guva tower press, and the Osprey filterbelt press are examples of variable-volume belt-type units employing mechanical squeezing as the driving force without need for suction or pump pressure. (Brown-IPC)

AN EVALUATION OF THE ADSORPTIVE PRO-

PERTIES OF FLY ASH AND BARK-DERIVED ACTIVATED CHAR, National Council of the Paper Industry for Air and Stream Improvement, Inc. New York. R. C. Whittemore.

NCASI Stream Improvement Technical Bulletin. No 267, 41 p. May 1973. 4 fig, 22 tab, 56 ref.

Descriptors: *Fly ash, *Activated carbon, Bark, *Wood wastes, *Adsorption, Pulp wastes, *Waste water treatment, Phenols, Iodine, Color. water treatment, Phenols, Iodine. Color. *Biochemical oxygen demand, *Bleaching wastes, Hardwood, Softwood, Alkalinity, Acidity, Hydrogen ion concentration, Lime, Effluents, Water pollution treatment, Pollution abatement, Water pollution control, Pulp and paper industry Charcoal. Identifiers: Adsorbents, Charce Woodrooms(Pulp mill), Bleach plants, W water, Paper machines, Paper mills, Pulp mills.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

The pollutant-adsorbing characteristics of 18 representative fly ash samples were evaluated. Fly derived from conifer bark adsorbed phenol nearly as well as did a commercial activated carbon, but were less effective toward iodine. Fly ashes from deciduous bark effectively removed both color and BOD from an alkaline bleach plant effluent, partly owing to the high lime content of these wastes. Bark-derived chars removed BOD and color from an acidic bleach plant effluent and from a caustic woodroom effluent, but were ineffective clarified paper mill waste water. (Buchanan-IPC) W74-08435

PULP INDUSTRY AND ENVIRONMENTAL PROTECTION (ZELLSTOFF-INDUSTRIE UND UMWELTSCHUTZ),

R. H. Seidl

Oesterreichische Papier-Zeitung, Vol 79, No 6, p 1, June 1973.

Descriptors: Pulp and paper industry, Europe, *Pulp wastes, *Sulfite liquors, Treatment facilities, *Mangnesium compounds, *Sulfur compounds, Pollution abatement, Costs, Capital costs, Water pollution control.

Identifiers: Austria, *Lenzing pulping process, Chemical recovery, Spent sulfite liquors, Dissolving pulps, Magnesium bisulfite.

An outline is presented of pollution-control efforts by the pulp and paper industry in Austria. The magnesium bisulfite pulping and chemical recovery process developed by Chemiefaser Lenzing AG. is described in particular. It is geared to the use of commercially available Austrian magnesite for the manufacture of dissolving-grade pulps with recovery of MgO (85%) and sulfur (70%). About 95% of all spent liquors are being subjected to the evaporation, combustion, and chemical recovery process. Another Austrian in-stallation treats 97-98% of its spent liquors in a million Austrian shillings. (Speckhard-IPC)
W74-08436

LAMELLAR SEDIMENTATION OF FIBER-CARRYING WASTE WATERS (LAMELLSEDIMENTERING AV FIBERHOL-DIG VANN), Norwegian Pulp and Paper Research Inst., Oslo.

O. Ronning.

Norsk Skogindustri, Vol 27, No 11, p 310-314, Nov 1973. 10 fig, 2 tab, 5 ref. English summary.

Descriptors: *Pulp wastes, *Fibers(Plant), Suspended solids, *Waste water treatment, *Sedimentation, Flow around objects, *Flow augmentation, *Flow separation, Theoretical analysis, Equipment, *Treatment facilities, Pulp and paper industry, Pollution abatement.

Identifiers: Surface area, Specific surface, Lamellar savealls, Savealls, White water, Fiber recovery, Fines(Fine fibers), Paper machines,

The lamellar principle of solids recovery from paper-machine white water is based on the use of inclined plates in the sedimentation unit in order to increase the effective area available for the settling of fines (fine fibers). Three white waters from different paper machines were subjected to lamellar sedimentation at different overflow rates. The optimum overflow rate was found to depend on the settling behavior of fibers tested in a laboratory sedimentation pipe. The lamellar principle can increase the capacity of existing clarifiers and the efficiency of fines recovery from white water systems. Some theoretical and practical details of ne principle are described and illustrated. (Brown-W74-08437

SLUDGE INCINERATION AND AFTERBURN-ING.

Dorr-Oliver, Inc., Stamford, Conn.

R. B. Zang.

Deeds and Data (Water Pollution Control Federation), April 1974, p D2-D3, D5, D10. 1 fig, 6 ref.

Descriptors: *Incineration, *Sludge treatment, *Dewatering, *Drying, *Fly ash, *Air pollution, *Odor, Fuels, Operation and maintenance, Treatment facilities, Sludge disposal, Sludge. Identifiers: Furnaces, Flue gases(Stack gases)

The installation of afterburners is not justifiable from a process viewpoint. The further use of highcost afterburners with concomitant problems of equipment dimensioning should be discouraged. A return to the basic principle of multiple-hearth furnace operation is advocated. Effective incineration of sludge without offensive exhaust gases can be achieved by allowing domestic sludge to dry to 50% moisture on the upper hearths, using only the heat from rising flue gases, in the absence of direct flame, and then dropping the sludge to a burning hearth at temperatures sufficient to destroy or ganic compounds. At least two or three full hearths should be allowed for sludge predrying without auxiliary fuel. Under varying loads, the drying and burning zones of sludge incinerators should be maintained by changing the speed of the center shaft, in addition to controlling the auxiliary fuel. Scrubbers should be designed to remove not only fly ash but also any water-soluble volatile acids that might excape. Subcooling of the flue gases will also limit the visible plumes that have created the erroneous impression that sludge incinerators are serious sources of air pollution. W74-08441

AUTOMATIC WASTE SLUDGE SAMPLER.

Plant, Allison Park, Pa.
For primary bibliographic entry see Field 5A.

ANAEROBIC BIOLOGICAL STABILIZATION OF SANITARY LANDFILL LEACHATE, Kentucky Univ., Lexington. Office of Research and Engineering Services. E. G. Force, and V. M. Reid.

E. G. Foree, and V. M. Reid. Available from NTIS, Springfield, Va. 22151, PB-219 043, Price \$4.50 printed copy; \$0.95 microfiche. College of Engineering Technical Re-port 65-73-CE 17, January 1973. 43 p, 8 fig, 4 tab, 14 ref.

Descriptors: *Landfills, *Leaching, *Water pollution control, *Waste water treatment, Water pollution treatment, Biodegradation, Oxygen demand, *Anaerobic digestion.
Identifiers: *Anaerobic filters.

Sanitary landfill leachate was treated anaerobic biological methods. Two treatment systems, the anaerobic digester and the submerged anaerobic filter, were evaluated. Three digesters operated at 35 deg C and loaded at 40 lb COD/1000 cu ft/day (20-day detention time) had COD removal efficiencies from 93% to 95%. A fourth digester operated 35 deg C and loaded at 80 lb COD/1000 cu ft/day (10-day detention time) had a COD removal efficiency of 92%. A fifth digester operated at 20 deg C loaded at 40 lb COD/1000 cu ft/day (20-day detention time) had a COD removal efficiency of 77%. COD removal efficiencies were calculated based on the soluble COD of the effluent. The anaerobic filter had a loading of 80 lb COD/1000 cu ft/day (10-day detention time) and a final COD removal efficiency of 96%. An activated sludge unit, added for further stabilization of the filter effluent, increased the total COD removal efficiency to 97%. (Knapp-USGS) BIOLOGICAL, PHYSICAL AND CHEMICAL TREATMENT OF WOOD SOAKING VAT WASTEWATER,

Kentucky Univ. Lexington Dent of Civil Engineering. E. G. Foree, and R. J. Bruner, III.

Available from NTIS, Springfield, Va. 22151, PB-219 020, Price \$3.00 printed copy; \$0.95 microfiche. College of Engineering Technical Report 66-73-CE 18, January 1973. 42 p, 5 fig, 9 tab, 9

Descriptors: *Waste water treatment, *Activated sludge, Activated carbon, Chemical oxygen demand, Chlorination, Color, *Biological treatment, *Anaerobic digestion.

A treatment process was developed for wood soaking vat leachate. The wastewater from these soaking vats is highly colored (2200 to 5000 color units) and had a relatively high COD (3500 mg/liter to 7700 mg/liter). Several laboratory-scale activated sludge units and one anaerobic digester were evaluated. Anaerobic digestion was not a satisfactory treatment process, but activated sludge treatment at a 10-day retention time without sludge recycle gave efficient treatment (97% COD removal and 78% color removal). Activated sludge treatment was followed by alum-lime flocculation to speed sludge settling, and to increase color and COD removal. This treatment used 750 mg/liter alum and 20 mg/liter lime and yielded total COD removal efficiency of 98.1% and total color removal of 93.6%. The effluent from the flocculation treatment was further polished by chlorina-tion and activated carbon treatment. The max-imum removal efficiency achieved from this process was 99.0% COD removal and 99.5% color removal. (Knapp-USGS)

WATER RESOURCES, ENVIRONMENT AND NATIONAL DEVELOPMENT--VOLUME I: SUMMARY OF PROCEEDINGS, AND VOLUME II: SELECTED PAPERS. For primary bibliographic entry see Field 5G. W74-08454

THE REUSE OF SEWAGE EFFLUENT FOR IN-

DUSTRIAL PURPOSES IN SINGAPORE, Singapore Dept. of Public Works. Sewerage Branch.

In: Water Resources, Environment and National In: water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 61-71, 1972. 3 fig. 2 tab. 1 ref.

Descriptors: *Water reuse, *Reclaimed water. Sewage treatment, *Waste water treatment, In-dustrial water, Recycling. Identifiers: *Singapore.

Reuse of sewage effluent in Singapore has been practiced since the first treatment works, the Alexandra Road Sewage Disposal Works, was established in 1915. Reclaimed water is used for multiple purposes such as cleaning tanks, watering plants, and cooling. The final effluent from the Ulu Pandan Sewage Treatment Works is treated for reuse as industrial water by filtration and chlorination. About 3 mgd of industrial water is used daily by some 34 industries. (See also W74-08454) (Knapp-USGS) W74-08458

MUNICIPAL WASTEWATER RECLAMATION AND REUSE.

Camp, Dresser and McKee International, Inc., Boston, Mass.

R. H. Culver, and R. H. Thomas.

In: Water Resources, Environment and National Development--Volume II: Selected Papers;

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 87-94, 1972. 2 tab. 13 ref.

Descriptors: "Water reuse, "Reclaimed water, "Waste water treatment, Sewage treatment, "Municipal water, Water supply, Water quality, California. Identifiers: South Africa.

Methods used to reclaim usable water from municipal wastewater are reviewed. The results obtained, the costs of construction and operation, the precautions to be observed in the use of reclaimed water, and alternative potential uses of reclaimed water are considered. The water reclamation projects at Santee and South Lake Tahoe in California, and at Windhoek in South West Africa are described in detail. (See also W74 08454) (Knapp-USGS) W74-08461

PLANNING FOR WATER REUSE,

North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.

In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 121-127, 1972, 46 ref.

Descriptors: *Water reuse, *Water distribution(Applied), Water management(Applied), *Reclaimed water, Public utilities, Water conservation, *Planning,

Reclaiming wastewaters for nonpotable purposes, such as for urban irrigation, industry, and toilet flushing, in a planned water resource program relieves the pressure on limited resources of high quality water, reduces the cost of water for nonpotable purposes, reduces pollution of the receiving bodies of water, and reduces the risk in polluted waters that would be used for drinking if such a water reclamation program was not instituted. A hierarchy of water quality is proposed, whereby high quality freshwaters would be reserved for high quality uses such as drinking and cooking, while polluted waters and reclaimed wastewaters would be used for nonpotable purposes. (See also W74-08454) (Knapp-USGS) W74-08465

SEWERAGE; SEWAGE TREATMENT AND DISPOSAL IN SINGAPORE, Singapore Dept. of Public Works. Sewerage

Branch.

In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 143-180, 1972. 10 fig, 3 tab, 6 ref.

Descriptors: *Sewage treatment, *Waste water disposal, Waste treatment, Environmental sanitation, Sanitary engineering, Sewage disposal. Identifiers: *Singapore.

The history of the sewerage system in Singapore from its inception to the present is discussed. The method of treatment and modus operandi are described; capital and operating costs are discussed. The future of the existing works, the need for additional treatment for the future and the types of works for the future also discussed. (See also W74-08454) (Knapp-USGS) W74-08467

DISPOSAL OF INDUSTRIAL TRADE EF-FLUENTS FROM THE FOOD INDUSTRIES,

Singapore Inst. of Standards and Industrial Research.

Tan Hui Boon.

In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, Science Council of Singapore, p 181-188, 1972. 2 tab. 15 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Food processing industry, Industrial wastes, Organic matter, Heavy metals. Identifiers: *Singapore.

The problems of trade effluent disposal faced by the food industries in Singapore are discussed. The food industry includes manufacture of meat, vegetable, dairy, oil and fermented products. Partly because of the character of the trade effluents, it may be possible to channel such wastes directly into sewers subject to a levy imposed by the relevant authority. (See also W74-08454) (Knapp-USGS) W74-08468

PETROLEUM REFINERY EFFLUENT OUALI-TY CONTROL,

Esso Research and Engineering Co., Linden, N.J. R. Kilpert.

In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13 1972: Science Council of Singapore, p 224-230, 1972. 9 fig.

Descriptors: *Water pollution control, *Waste water treatment, *Oily water, *Oil industry, Tertiary treatment, Oil fields, Oil wastes, Membrane processes, Industrial wastes.

The protection of water is of concern to the petroleum industry. Further, population growth, greater energy demand, and urbanization increase regulation of industrial discharges. Effective and economical long-range planning and implementa-tion of pollution control facilities require a reasonable, scientific approach when setting allowable contaminant levels. Dissolved air flota-tion, mixed media filtration, and chemical flocculation are used to separate oil and water. For oxygen demand reduction, various biological treat-ment processes are available including stabilization lagoons, trickling filters, and activated sludge. Chemical oxidation, using sodium peroxide or chlorine, is known but rarely used. Adsorption on carbon is also possible. Hydrogen sulfide may be removed by stream, air and flue gas stripping or fractionation. Ammonia may be reduced by high temperature stripping, fractionation or biological treatment. Biological treatment is also effective for phenol removal as are adsorption on carbon and injection into refinery desalters. Ion exchange, for example, can be used to reduce chemical oxygen demand (COD), total dissolved solids (TDS) and suspended solids. At the same time, odor- and color-producing contaminants and some toxic substances are substantially removed. Promising membrane processes include reverse osmosis and electrodialysis. (See also W74-08454) (Knapp-USGS) W74-08473

POLLUTION CONTROL OF DISCHARGE INTO RIVERS, LAKES AND COASTAL WATERS IN THE PHILIPPINES, National Water and Air Pollution Control Com-

mission, Manila (Philippines). For primary bibliographic entry see Field 5G.

ANALYSIS OF WATER REUSE ALTERNA-TIVES IN AN INTEGRATED URBAN AND AGRICULTURAL AREA, Utah Water Research Lab., Logan.

A. B. Bishop, and D. W. Hendricks. In: Systems Planning and Design: Case Studies in Modeling, Optimization, and Evaluations (Ed. by R. de Neufville and D. H. Marks). Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 169-189 (Chapter 13), 1974. 8 fig, 3 tab, 8 equ, 12 ref.

Descriptors: *Water allocation(Policy), *Water utilization, *Water reuse, *Linear programming, Water supply, *Water demand, *Alternative planning, Transportation. Waste water treatment. Evaluation, Regions, Optimization, Design, Analytical techniques, Recycling, Decision making, Water quality. Water quantity. Constraints. Water costs. Desalination. Tertiary treatment, Systems analysis, Mathematical models, *Utah. Identifiers: Cost minimization, Multiobjective planning, *Salt Lake City(Utah), Urban areas, Agricultural areas, Sequential reuse, Parametric

A methodology is developed for exploring all per-mutations of water use and selecting the best alternatives. Presented is a conceptual framework for analyzing water reuse alternatives; a linear programming model for evaluating alternatives of sequential and recycle reuse in an integrated agricultural and urban environment is developed. The model determines the optimal allocations of water from each supply source to each use sector. and can be used either to minimize cost or maximize net benefits. Since quality constraints may necessitate treatment before reuse, three levels of treatment are considered: (1) conventional primary-secondary; (2) tertiary; and (3) desalting. The model is used to solve transportation problem, the objective being to minimize the cost to the region of transporting and treating water subject to constraints. Next, problems associated with water treatment operations, desalting plants, blending facilities, and physical system limitations are considered in terms of being incorporated into the basic transportation model. The reuse model is applied to the Salt Lake City, Utah area. The study indicates: how primary, secondary, and recycle supply sources should be allocated to satisfy demands at least cost; given a constant water supply and projections of future demands, it shows the of treatment processes for water reuse which would meet demands most cheaply; The dicated, as well as, through parametric analysis, the time when they should be phased into the system. (See also W74-08506) (Bell-Cornell)

LABORATORY FLOTATION STUDIES TENNESSEE PHOSPHATES IN THE PRESENCE OF SLIMES,

Bureau of Mines, Tuscaloosa, Ala. Tuscaloosa Metallurgy Research Center. W. E. Lamont, C. E. Spruiell, Jr., D. R. Brooks.

Bureau of Mines Report of Investigations 7601, 1972. 17 p. 17 tab.

Descriptors: *Phosphates. *Mine Recycling, *Flotation, *Waste treatment. Separation techniques, Water pollution control, Industri-al wastes, *Tennessee. *Slime. Identifiers: Phosphate slimes.

Phosphate-bearing waste pond materials, low-grade washer products, and raw ores, all from the Tennessee brown phosphate district, could be treated without desliming to recovery high-grad phosphate concentrates. Fine grinding before flotation was a requisite for increased recovery of the phosphate values. The optimum pH conditions were in the range of 10.0 to 10.5 when using anionic collectors. Multiple cleaning of the rougher phosphate concentrate was required to produce high-grade concentrates. Phosphates

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Ultimate Disposal Of Wastes—Group 5E

recoveries ranged from 60% to 82% and were inversely related to the grade of concentrate produced (Knapp-USGS) W74-08588

RECOVERY OF PHOSPHATES AND METALS FROM PHOSPHATE SLUDGE BY SOLVENT

Bureau of Mines, Rolla, Mo. Rolla Metallurgy

Bureau of Mines, Rolla, 1806. Rolland Research Center.
H. E. Powell, L. L. Smith, and A. A. Cochran.
Bureau of Mines Report of Investigation 7662,
1972. 12 p, 4 fig, 6 tab, 11 ref.

Descriptors: *Phosphates, *Mine wastes, *Recycling, *Solvent extractions, *Waste treatment, Separation techniques, Water pollution con-trol, Industrial wastes, Slime. Identifiers: Phosphate slimes.

A solvent extraction procedure was developed for recovering trisodium phosphate, zinc, and iron from waste phosphate sludge. The sludge is dis-solved in hydrochloric acid, and iron is extracted as ferric chloride by isopropyl ether. Zinc is ex-tracted by di-2-ethylhexyl phosphoric acid in kerosine. The efficiencies of the one- and twostage extractions range from 98% to nearly 100%. Trisodium phosphate is recovered by crystallization from the raffinate. The value of two marketable products is considerably more than the costs of the major reagent. The process was developed to permit recycling of values in this waste and to con-sequently reduce stream pollution. (Knapp-USGS)

ELECTROPHORESIS AND COAGULATION STUDIES OF SOME FLORIDA PHOSPHATE SLIMES,

Bureau of Mines, Tuscaloosa, Ala. Tuscaloosa Metallurgy Research Lab.

O. Terichow, and A. May. Bureau of Mines Report of Investigations 7816, 1973. 2 fig, 4 ref.

Descriptors: *Waste disposal, *Coagulation, *Mine wastes, *Phosphates, Water pollution control, Clays, *Waste treatment, Industrial wastes, Flocculation, Ion exchange, Separation techniques, *Florida, *Slime.

Identifiers: Phosphate slimes.

A method is being developed to promote rapid set-tling of the solids in wastes from phosphate processing by the addition of a particle system not intrinsically associated with the slimes. The fines from phosphate-rock beneficiation are discharged as a waste clay-slime in a slurry of about 5% solids. Current practice is to store the slimes besolids. Current practice is to store the sames of solid likes or dams for settling, which takes place very slowly, sometimes extending well over a decade. The problem is aggrevated by the volume of the slimes that occupy 1.5 times the volume of the cavity left from mining the matrix, and storage of the clima in surface impoundments process a of the slime in surface impoundments poses a potential environmental hazard, even with wellconstructed dams and dikes. Electrophoretic mo-bility measurements were made on samples of Florida phosphate slimes to determine the op-timum conditions of coagulation and precipitation in aluminum sulfate solutions. Addition of silica sand and other selected materials as mutual coagulants demonstrates the practicability of coagulat-ing two dissimilar particle systems by elimination of the repulsive double layers. By proper selection of the solution and its concentration, reduction of the double layer to a zero point of charge causes coagulation and rapid precipitation of both particle systems. (Knapp-USGS) W74-08591

ANALYSES OF TARS, CHARS, GASES, AND WATER FOUND IN EFFLUENTS FROM THE SYNTHANE PROCESS, Bureau of Mines, Pittsburgh, Pa. Pittsburgh Ener-

gy Research Center.

For primary bibliographic entry see Field 5A.

CONTROL OF MINE DRAINAGE FROM COAL MINE MINERAL WASTES: PHASE II. POLLU-TION ABATEMENT AND MONITORING, Consolidation Coal Co., Pinckneyville, Ill. Midwestern Div.

For primary bibliographic entry see Field 5G. W74-08661

INDUSTRIAL PROCESSING WITH MEM-BRANES.

Wiley-Interscience, New York, N.Y. 1972. R. E. Lacey and S. Loeb, editors, 348 p.

Descriptors: *Membrane processes, *Waste water reatment, *Reverse osmosis, *Filtration, *Infiltration, *Permeability, *Electrodialysis, *Water purification, Pulp wastes, Industrial wastes, Pollution abatement, Treatment facilities, Economics. Identifiers: *Ultrafiltration.

The 13 chapters of this volume, authored by different experts, discuss the theoretical principles, physical chemistry, technology, practical applica-tions, and economic aspects of electrically driven and pressure-driven membrane processes, notably reverse osmosis, ultrafiltration, and gas permeation. Included are 2 chapters on applications of electrodialysis and reverse osmosis to the treat-ment of pulp and paper mill and other industrial wastes. Pertinent references to the literature are listed after each chapter. A subject index is appended. (Brown-IPC) W74-08664

5E. Ultimate Disposal Of Wastes

RIPPON SQUASHES CENTRAL WASTE TREATMENT PRECEDENT. M. Shwer.

Surveyor, Vol 143, No 4263, p 10, February 1974.

*Administrative *Chemical wastes, *Waste disposal, Sites, Waste treatment, *Waste water treatment, *Treatment Identifiers: *Great Britain(Birmingham)

A decision regarding the site of a chemical waste treatment plant near Birmingham, England is discussed. Environment Minister Geoffrey Rippon refused the site because local residents put up a strong opposition to a waste treatment plant on the grounds they had suffered from previous industrial development. The proposed plant was to have handled up to 10 tons of solids and 45,000 gallons of concentrated aqueous wastes per week by chemical treatment. A further two tons of both liquid and solid wastes were to have been incinerated per hour, adding up to 350 tons per week incinerated. This last figure is the equivalent of 80,000 gallons a day of solvents. The chemical plant effluent would have been about 10-20,000 gallons per day, and residues were expected to amount to some 20 tons per week from chemical treatment and 60-70 tons per week from incineration. (Merritt-FIRL) W74-08213

AUTOMATION COMES TO L.A., Brown and Caldwell, San Francisco, Calif. For primary bibliographic entry see Field 5D. W74-08225

THOSE NASTY PHOSPHATIC CLAY PONDS. For primary bibliographic entry see Field 5D. W74-08227

NEW METHODS TO DISPOSE OF USED METALWORKING EMULSIONS, (NEUE VER-FAHREN ZUR BESEITIGUNG GEBRAUGHTER METALL-BEARBEITUNGS-EMULSIONEN), Esso AG Forschungszentrum, Hamburg (West Germany).

For primary bibliographic entry see Field 5D. W74-08247

SEWAGE TREATMENT AND DISPOSAL For primary bibliographic entry see Field 5D. W74-08261

EXAMPLES OF SEWAGE SLUDGE INCINERA-TION IN THE UK,

For primary bibliographic entry see Field 5D. W74-08364

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES.

Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.

J. C. Van Loon.

Environment Canada, Research Program for Abatement of Municipal Pollution, Canada-On-tario Agreement on Great Lakes Water Quality, Research Report No. 9, March 1973. 37 p, 3 fig, 10 tab, 31 ref, 2 append. 72-5-3.

Descriptors: *Sewage treatment, *Sludge disposal, *Fertilizers, *Land management, Agriculture, Agronomic crops, *Soil disposal fields, Nutrients, *Toxicity, *Heavy metals, Surveys, Publications, Data collections, Sludge, Standards dards, Sampling, Soil-water-plant relationships, Plant growth.

The spreading of sewage treatment plant sludges on agricultural lands could achieve a double objective as a disposal mechanism and as a source of plant nutrients, provided that toxic effects (e.g., from heavy metal contaminations) can be alleviated. A survey of research reports from various countries disclosed few precise results on plant-metal interactions. The use of standard and control samples for validating the data is urged. No conclusions, except a few generalizations, are warranted at present. (Brown-IPC) W74-08397

PERMEABILITY OF HIGH ASH PAPERMILL SLUDGE.

Michigan State Univ., East Lansing. Dept. of Civil Engineering. For primary bibliographic entry see Field 5D.

SLUDGE INCINERATION AND AFTERBURN.

Dorr-Oliver, Inc., Stamford, Conn. For primary bibliographic entry see Field 5D. W74-08441

ACTIVATED SLUDGE DISPOSAL IN A SUB-ARCTIC ENVIRONMENT, Hill, Ingman, Chase and Co., Seattle, Wash.

C. Patterson.

Deeds and Data (Water Pollution Control Federation), April 1974, p D6-D8, 3 tab, 3 fig, 2 ref. (Paper presented at 46th Annual Conference, WPCF, Cleveland, Ohio, Sept. 30-Oct 4, 1973).

*Subarctic, *Alaska, Descriptors: disposal, "Activated sludge, "Cold regions, "Costs, "Operating costs, "Transportation, Climatology, Temperature, Heating, Ice fog, Fog, Weather, Weather patterns, Microorganisms, Pathogenic bacteria. Identifiers: Trucks, Trucking.

Subarctic environments pose special problems which aggravate the already difficult tasks of

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5E-Ultimate Disposal Of Wastes

sludge disposal. These problems include survival of pathogenic microorganisms, the generation of ice fog, the prevalence of subzero temperatures, and the need for seasonal adjustments in operating procedures. A flexible solution to these problems procedures. A flexible solution to these problems has been attempted in Fairbanks, Alaska. It makes use of temperate-climate technologies plus appropriate adaptations, such as heated trucks. Costs of such an operating system are also indicated. (Brown-IPC) W74-08443

SEWERAGE; SEWAGE TREATMENT AND DISPOSAL IN SINGAPORE,

Singapore Dept. of Public Works. Sewerage Branch.

For primary bibliographic entry see Field 5D. W74-08467

EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL. VTN, Orlando, Fla. Available from the National Technical Informa-

tion Service as PB-224 996, \$5.25 in paper copy, \$1.45 in microfiche. Final Report, 1973. 172 p, 36 fig, 42 tab, 25 ref, 1 append. S-802283.

Descriptors: *Landfills, *Water manage-ment(Applied), Pollution, *Water table, *Drainage systems, *Solid wastes, *Florida, Groundwater, Waste water, Sewage treatment, Sewage ef-fluents, Water pollution sources, Water pollution, Water quality, Leachate, Water wells, Wellpoints, Future planning(Projected), Long-term planning, Drainage programs, Drainage water, Drainage wells, Flood control, Flooding, Floods.

Identifiers: *Orange County(Florida), Sanitary

fill, Solid waste demonstration grant, Little Econ-lockhatchee River(Fla), Demonstration cells.

A long-range program upgrading the Orange County, Florida, solid waste disposal system is being implemented. While sanitary landfilling is the disposal method used, information concerning sanitary landfill in areas with a high ground water table is lacking. To obtain it, the county obtained a Solid Waste Demonstration Grant from the Environmental Protection Agency to carry out a three-year program of tests. A survey of the first two years' progress is presented. Evidence shows that 'demonstration cell' designs for public use and franchised refuse collection are satisfactory, while procedures for handling smaller public vehicles are being studied. The drainage system is effective in preventing project flooding during intensive rainfall, but rains have caused localized flooding. Water quality investigations of Little Econlockhatchee River show pollution from two areas of domestic waste effluents. With one exception, shallow well chemical sampling shows pollution-free water, providing excellent natural baseline data facilitating contamination detection from sanitary landfill leachates. Total Model Landfill expenses showed a cost/ton ratio of \$3.37, but is expected to drop to \$2.81 due to stability of operating techniques, equipment maintenance improve-ment, and personnel experience. (Grden-North Carolina) W74-08486

WASTE DISPOSAL SYSTEMS FROM A GROUNDWATER HYDROLOGY AND POLLU-TION POINT OF VIEW,

Ministry of the Environment, Ottawa (Ontario). Water Quality Branch.

R. J. Patterson

Water and Sewage Works, Reference No 1974, p R92-R99, April 30, 1974. 3 fig, 2 tab, 3 ref.

Descriptors: *Waste water disposal, *Water pollution control, *Groundwater, Groundwater movement, Infiltration, Seepage, Irrigation water, Sprinkler irrigation, Hydrogeology. Identifiers: *Land disposal(Wastes), Spray irriga-

dled by systems employing infiltration basins, surface flooding and spray irrigation. In an unconfined aquifer situation the water-table will mound beneath the disposal site. As the height of the mound increases the rate of groundwater flow away from the site becomes greater. When a stable mound configuration is established the increase in groundwater flow from the site balances the new input of effluent. The development of a ground-water mound will alter natural water-table gradients, and may cause some of the waste to flow in different directions then the normal direction of groundwater flow. Proper and complete hydrogeologic, soil, and design data can permit prior recognition of areas susceptible to ground and surface water pollution. (Knapp-USGS) W74-08594 5F. Water Treatment and

Disposal and treatment of solid and liquid wastes

on land are gaining wide acceptance. Numerous

methods for dealing with the many types of waste

are available: solids, depending on the source, may be landfilled or spread; while liquids are han-

Quality Alteration

THE ROLE OF DISINFECTION IN THE OPTIMUM ENVIRONMENT, Georgia Inst. of Tech., Atlanta.

R. S. Ingols.

Journal of the Society for Water Treatment and Examinations, Vol 22, No 3, p 147-152, 1973. 10

Descriptors: *Disinfection, *Water purification, *Swimming pools, Chlorine, *Chlorination, Industrial wastes, Public health, Ecology, Environment, Waste water treatment.

A philosophical discussion on the definiation of an optimum environment and the role of disinfection in achieving it is presented. Part of the dilemma facing today's control agencies lie in the fact that the answer to yesterday's major problem is today's enigma. The best example of confusion in today's engina. The best example to confusion in the aquatic environment is the required main-tenance of high free chlorine residuals to kill all bacteria and viruses instantly in public and semipublic swimming pools. Yet, chlorine was added to industrial wastes and failed to reduce the bacterial count of coliform organisms. In a report of studies upon the bacterial numbers found in the swimming beaches of several small lakes, it was found the people who swam there had fewer infections than those people who swam in chlorinated pools. The public health philosophy stresses a high free chlorine content, while the ecologists feel that a clear water is not more likely to induce disease transmission than personal contact in any other environment. (Merritt-FIRL)

POTABLE-WATER SUPPLY BY MEANS OF UP-FILTRATION (L'EAU

Dept. of Tulane Univ., New Orleans, La. Dept. of

Dept. of Turane Univ., New Orleans, La. Dept. of Civil Engineering. B. J. Haney, and S. E. Steimle. Journal of the American Water Works Associa-tion, Vol 66, No 2, p 117-123, Feb, 1974. 8 fig, 5 tab. 15 ref.

*Flitration. Evaluation, Descriptors: *Polyelectrolytes, *Potable water, *Water supply, *Waste water treatment, Performance, Filters, Turbidity, Water quality, Treatment facilities, *Water treatment

Identifiers: Upflow filtration, L'Eau Claire

Upflow filtration is a recent development in the history of water filtration. By using polyelec-trolytes and progressively finer filter media a pota-ble water can be produced that compared favorably with waters treated by conventional methods that require flocculation, sedimentation, and filtration. The L'Eau Claire process is a water treatment method that uses both of these developments. To recognize the potential of upflow filtration in potable-water production, an upflow research project was initiated using a 4-foot diameter upflow filter in the evaluation. Test results indicate that the process with effluent disinfection can be used as a means of potable water treatment of surface supplies, yielding excellent quality water under continuing operation. It should be noted that atturbidities above 280 Itu the utility of the process is limited by very short filter runs. However, process parameters and plant configuration can be altered to compensate for this deficiency. (Sandoski-FIRL) W74-08210

VIRUS REMOVAL BY DIATOMACEOUS-EARTH FILTRATION - PART 1, Gibbs and Hill, Inc., New York, N.Y.

T. S. Brown, J. F. Malina, Jr., and B. D. Moore. Journal of the American Water Works Association, Vol 66, No 2, p 98-102, February 1974. 3 fig. 6

Descriptors: *Diatomaceous earth, *E. coli, *Viruses, *Bacteriophage, *Filtration, Desorption, Hydrogen ion concentration, Efficiencies. *Waste water treatment, *Water treatment. Identifiers: *Virus removal.

This study, involving the removal of bacterial viruses from water using diatomaceous earth filter aids, covers the comparative properties of uncoated and polyelectrolyte-coated products as they affect the process. The work is based on studies using bacteriophage T2 for Escherichia coli. The removal efficiencies presented were calculated to represent only that removal due to attachment to the diatomaceous earth and filtration through the filter aid. The optimal T2 recovery required attachment at pH 6.25 and desorption at pH 9.55. The procedure for coating the filter aid with inorganic coagulants affects the efficiency of T2 virus removal. (Sandoski-FIRL) W74-08215

THE COUNTING OF AEROBIC ACTINO-MYCETES IN WATER SAMPLES (DENOMBREMENT DES ACTINOMYCETES AEROBIES DE L'EAU), Institut Pasteur, Lille (France). Laboratoire

d'Hydrobiologie. For primary bibliographic entry see Field 5A.

THE PROS AND CONS OF AUTOMATED FIL-TERS.

Gary-Hobart Water Corp., Gary, Ind. For primary bibliographic entry see Field 5D. W74-08226

W74-08220

DISINFECTION OF WATER USING CHLORINE

Wallace and Tiernan, Inc., San Francisco, Calif. For primary bibliographic entry see Field 5D. W74-08253

NITRATE REMOVED AT WATER TREAT-MENT PLANT,

Bowne (Sidney B.) and Son, Mineola, N.Y. J. C. Gregg.

Civil Engineering-ASCE, Vol 43, No 4, p 45-47, April, 1973. 1 fig.

Descriptors: *Water treatment, *Water quality, Water pollution sources, *Nitrates, *Ion Water pollution sources, *Nitt exchange, *New York, Water supply. Identifiers: *Long Island(N.Y.).

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

Rising nitrate content in the water supply in Long Island has become a problem, mainly due to sharply increasing population and the widespread use of septic tanks and cesspools there. In one water district, it was serious enough to shut down wells with a potential reduction of 60% in the area's water supply. A solution seems to be found by adapting an ion exchange method to remove the nitrates from the water. (Skogerboe-Colorado State) W74-08317

MANUAL FOR CALCULATION OF CONVEN-TIONAL WATER TREATMENT COSTS, Control Systems Research, Inc., Arlington, Va. For primary bibliographic entry see Field 3A. W74-08333

BRACKISH WATER DESALTING, TESTING AND EVALUATION PROCEDURES WITH MO-

Burns and Roe Construction Corp., Paramus, N.J. For primary bibliographic entry see Field 3A.

BITUMINOUS COAL - A SUBSTITUTE FOR ANTHRACITE FILTER MEDIA IN TWO-LAYER FILTRATION OF WATER,

Central Public Health Engineering Research Inst., Nagpur (India). R. Paramasiyam, S. K. Gadkari, N. S. Joshi, and

A. W. Deshpande.
Indian Journal of Environmental Health, Vol 16, No 3, p 178-188, July, 1973. 4 fig, 1 tab, 9 ref.

Descriptors: *Filtration, *Application methods, *Water treatment, *Bituminous materials, *Water treatment, *Bituminous materials, *Filters, Pilot plants, Laboratory tests, *Waste water treatment

Identifiers: *India

High rate filtration using two-layer and mixed media filters is finding increasing application in both overloaded filters and new filter plants. Work done on the suitability of indigenous bituminous coal as a substitute material for anthracite filter media, which is not available in India, is described. Laboratory and pilot studies show that rates up to 50-100 percent higher than conventional filters can be achieved by adoption of two-layer filters using bituminous coal. (Sandoski-FIRL) W74-08350

REPLACEMENT OF THE REPLACEMENT OF THE ANTHRACITE SUBLAYER IN ANION-EXCHANGE FILTERS OF WATER PURIFICATION EQUIPMENT (ZAMENA ANTRATSITOVOGO PODSLOYA V ANIONITOVYKH FIL'TRAKH VODOOCHIST-NYKH USTANOVOK), Ukrainskii Nauchno-Issledovatelskii Institut Bu-

magi, Kiev.

For primary bibliographic entry see Field 5D. W74-08407

DEVELOPMENT OF WATER SUPPLY IN VIET-

Ministry of Health, Saigon (Vietnam). Environmental Sanitation Service. For primary bibliographic entry see Field 5G.

5G. Water Quality Control

APPLICATION OF REVERSE OSMOSIS TO ACID MINE DRAINAGE TREATMENT, Environmental Protection Agency, Rivesville, W. Va., Crown Mine Drainage Control Field Site. For primary bibliographic entry see Field 5D. W74-08155

REFE CATTLE FEEDLOT SITE SELECTION FOR ENVIRONMENTAL PROTECTION,

Robert S. Kerr Environmental Research Lab, Ada, Okla. National Animal Feedlot Wastes

Research Program.

R. D. Kreis, and L. R. Shuyler.

Copy available from GPO Sup Doc as
EP1.23/2:72-129, \$1.00; microfiche from NTIS as PB-232 701, \$1.45. Environmental Protection Agency National Environmental Research Center Report EPA-R2-72-129, November 1972, 39 p. 5 fig. 55 ref. append.

Descriptors: *Water pollution control, *Feed lots, Farm wastes, Cattle, Confinement pens, Path of pollutants, Farm management, Planning, Sites. Identifiers: *Site selection(Feedlots).

Environmental pollution can be significantly reduced in feedlots by adequate facility planning, management, and most importantly, by proper site selection Climatic, topographic, and local weather extremes of the general area, selected with regard to economic and market factors, should be con-sidered when planning the type of feeding facility. A site should then be selected which would decrease the pollution potentials and be readily adapted to necessary controls. This report should be used when locating a new facility or when modifying an existing feedlot. Many of the con-cepts and ideas presented cannot be economically superimposed on an existing operation. (Knapp-USGS) W74-08156

THE ECOLOGICAL ROLE OF INLAND WET-

Connecticut Coll., New London, Dept. of Botany. For primary bibliographic entry see Field 2L. W74-08164

INSECTS (CHRYSOPS FLIES) IN CONNEC-TICUT SALT MARSHES.

Connecticut Agricultural Experiment Station, New Haven For primary bibliographic entry see Field 2L.

W74-08166

FEDERAL POLICY TOWARDS WETLANDS. Environmental Protection Agency, Edison, N.J. Federal Water Programs. P I Nadean

In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 144-145, December 1973.

Descriptors: *Wetlands, *Connecticut, *Water Jaw, *Federal water pollution control act, Legisla-tion, Judicial decisions, Public rights, Water resources development, Swamps, Marshes, Tidal marshes. Land use.

The U.S. Environmental Protection Agency takes particular note concerning decisions on proposals that potentially will damage wetlands, to recognize the interrelationship between man and the wetlands, and to preserve and protect them from damaging misuses. The Agency minimizes alterations of natural water flow that nourishes wetlands by protecting them from adverse dredging or filling practices, solid waste management prac-tices, siltation or pesticide contamination or toxic material spills and through construction activities; and to maintain applicable water quality standards. The Agency does not grant Federal funds for construction of municipal waste water treatment facilities if such activities will interfere with the existing wetland ecosystem; the exception being that no other alternative of lesser environmental damage is found to be feasible. This policy im-plicates and involves all EPA program activities. (See also W74-08157) (Knapp-USGS)

PRELIMINARY SYSTEM DEVELOPMENT. CHEMICAL HAZARDS RESPONSE INFORMA-TION SYSTEM (CHRIS), APPENDIX VII-SUP-PORTING INFORMATION. Little (Arthur D.) Inc., Cambridge, Mass.

For primary bibliographic entry see Field 5B. W74-08181

THE CONTROL OF POLLUTION FROM HYDROGRAPHIC MODIFICATIONS.
Environmental Protection Agency, Washington, D.C. Office of Air and Water Programs.
Available from Sup Doc, GPO, Washington, D.C. 20402, price \$1.95. Report EPA-430/9-73-017, 1973. 188 p, 9 fig, 4 tab, 59 ref.

Descriptors: *Water pollution control. *Channel improvement, Urbanization, Reservoirs, Levees, Dams, Water pollution sources, Thermal stratification, Aeration, Path of pollutants. Identifiers: Water pollution control act.

Nonpoint sources of pollutants and processes, procedures, and methods to control pollution resulting from changes in the movement, flow or circulation of any navigable waters or ground-waters, including changes caused by the construc-tion of dams, levees, channels, or flow diversion facilities are discussed. Changes in flow patterns through channel modification, reservoir construction, urbanization, and other causes are identified and, if possible, methods to reverse or alleviate damages are described. (Knapp-USGS) W74-08186

GRANGEMOUTH TUNNEL SEWER. For primary bibliographic entry see Field 8A. W74-08197

CLEANUP DOWN BY THE OLD MILL STREAM.

Environmental Science and Technology, Vol 8, No 4, p 314-315, April, 1974.

Descriptors: *Federal Water Pollution Control Act, *Industrial Plants, *Legislation, Administra-tion, Political aspects, Administrative decisions, Identifiers: Amendments

Critical comments from industrial representatives Critical comments from industrial representatives on the Federal Water Pollution Control Act Amendments of 1972 are presented. The guidelines are considered too exact and inflexible to accommodate new pertinent information that result from research and development. Technical people from industry have no opportu-nities to comment on the proposed guidelines until the final stages of development. There does not al-ways appear to be ground rules for implementation of effluent guidelines. Little consideration is given to differences between individual companies or sites. The 30-day period for industry and public response is not sufficient for proper technical reviews and constructive industry input. A better two way communication between industry and government is called for so that industry can elicit uniform definitions, consistently explained regulations, and agreed upon ranges of numbers, and arrive at intelligent decisions and effect cost/benefit analyses. (Merritt-FIRL) W74-08203

WATER RESOURCES: KEY TO WESTERN FU-

Civil Engineering-ASCE, Vol 44, No 3, p 84-91, March, 1974. 5 fig.

Descriptors: Water resources, *Water reuse, Descriptors: Water resources, "Water reuse," "Water conservation, "Municipal wastes, Cloud seeding, "Tunnels, Excavation, Dredging, Reservoirs, Bulb turbines, Gravels, Mining, Salaries, Sanitary engineering, Industrial wastes, Water pollution sources, Pollution control, Leachate,

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

Landfills, Sludge treatment, Tertiary treatment, Aquifers, Saline water, Surge tanks, Land use, Ecology, Legislation, Political decisions, *Waste

Highlights of papers from the American Society of Civil Engineers 1974 National Meeting on Water Resources Engineering are presented. In the area of water reclamation, papers were presented on water conservation in Los Angeles; deep well in-jection of highly treated municipal sewage in Chicago; cloud seeding in South Dakota; and cloud seeding and citizen's participation. Papers on water related construction included the tightening of tunnel regulations; excavation in the dry in California; dredge spoil and ecology; repair of a quake demanged underground reservoir in the San Fernando Valley; the first U.S. bulb turbine; and gravel mining in the Mississippi River. Professional and planning papers included those in political contributions, a pension bill in Congress, and salary guidelines. Papers on sanitary engineering discussed the problem in Los Angeles of source control of industrial pollutants; leachate from landfills; methods of treating sewage sludge; a P-C tertiary plant in Cleveland; the disposal of waste water into a saline aquifer; and land and pond treatment around Lake Michigan. Other topics included the ecological impact of thermal discharge; surge storage tanks; land use planning and poor political ecological decisions. (Merritt-FIRL) W74-08204

PROJECT OF THE AGRICULTURAL AND MARINE POLLUTION CONTROL SECTION, MARCH 1973, Environmental Protection Agency, Washington,

D.C. Applied Science and Technology Branch K. Jakobson.

Copy Available from GPO Sup Doc as EPI.23/2:73-171, \$2.60; microfiche from NTIS as PB-227 340 \$1.45. EPA Office of Research and Monitoring Report EPA-R2-73-171, March 1973.

Descriptors: *Water pollution control, *Farm wastes, *Navigation, *Projects, Water pollution sources, Boats, Ships, Oil spills.
Identifiers: *Agricultural pollution control, *Water Pollution control,

*Marine pollution control, Nonpoint pollution.

The Agricultural and Marine Pollution Control Program of EPA is described in a compilation of the information sheets of the 160 projects initiated from fiscal year 1968 through fiscal year 1972. Each sheet contains the objectives, statistical information and a brief description of an initiated project. General introductory information on the Environmental Protection Agency's Agricultural and Marine Pollution Control Program is presented to provide perspective on the magnitude of these nonpoint pollution problems and the research direction that must be pursued in order to develop the technology to adequately control non-point sources in the United States. (Knapp-USGS) W74-08237

ENVIRONMENTAL RESEARCH AND HIGHWAYS,

For primary bibliographic entry see Field 5B. W74-08251

IMPROVED CONTROL OF RADIOACTIVE

WASTES, Atomic Energy Commission, Bethesda, Md. For primary bibliographic entry see Field 5D. W74-08255

EFFECTS OF STRAW, CALCIUM CHLORIDE, AND SUBMERGENCE ON A SODIC SOIL, California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. For primary bibliographic entry see Field 2G. W74-08274

GATED PIPE AND REUSE SYSTEM. For primary bibliographic entry see Field 3F.

THE CITIZEN AND WATER MANAGEMENT: AN ATLAS OF WATER ATTITUDES IN SOUTHERN MINNESOTA, Gustavus Adolphus Coll. St. Peter, Minn. Dept. of

Geography. For primary bibliographic entry see Field 6B. W74-08288

DETERMINATION OF OIL LOSS RATES FROM A HIGH SEAS OIL CONTAINMENT BARRIER,

California Univ., Santa Barbara. J. E. Estes, P. Mikolaj, and R. R. Thaman. Available from NTIS, Springfield, Va. 22151 AD-762 339 Price \$4.85 printed copy; \$1.45 microfiche. Coast Guard Office of Research and Development Contract Report, June 1972. 71 p, 19 fig, 7 append. Coast Guard Contract DOT-CG-23260-A.

Descriptors: *Water pollution control, *Oil spills, *Oily water, Equipment, *Barriers, Sampling, *California, Oil pollution.

Field tests of a high seas oil containment barrier were conducted to evaluate the barrier's oil containment efficiency under varying configurations and tow speeds. Coincident ground truth measurements of soybean oil film thickness and remote sensing imagery were acquired during the tests in order to determine the time dependent rate of oil loss and thereby establish an oil budget. The barrier performed efficciently when towing speeds approximated 0.5 knots, adequately at speeds under 1 knot, while there was catastrophic failure at speeds over 1 knot. (Knapp-USGS) W74-08290

IDENTIFICATION AND CONTROL OF POLLU-TION FROM SALT WATER INTRUSION. Environmental Protection Agency, Washington,

D.C. Div. of Water Quality and Non-Point Source

For primary bibliographic entry see Field 5B. W74-08293

ENVIRONMENTAL RESEARCH IN 1973--AN-National Environmental Research Center, Cincin-

nati, Ohio. Report EPA-670/9-74-001, February 1974. 99 p, 50 fig. 9 tab

Descriptors: *Pollution abatement, *Research and development. Environment. *Laboratories, development, Environment, *Laboratories, *Research facilities, Air pollution, *Water pollution. Water analysis.

The research program of the National Environ-mental Research Center (EPA) in Cincinnati, Ohio, is directed toward solving major environmental problems in wastewater management and treatment, drinking water, solid wastes, toxicants from automobile exhaust and other sources, industrial and hazardous waste mangement and control, radioactivity emissions from nuclear powerplants, and methods development and quality assurance The work of the Center is principally governed by legislative mandates. In the Second Annual Report of the National Environmental Research Center, the programs are described and progress during 1973 is delineated. Reports are from: Office of Director, Advanced Waste Treatment Research Laboratory, Analytical Quality Control Laboratory, Edison Water Quality Research Laboratory, Environmental Toxicology Research Laboratory, Radiochemistry and Nuclear Engineering Branch and Facility, Solid and Hazardous Waste Research Laboratory, Water Supply Research Laboratory, and International Activities. Topics discussed in detail include evaluation of asbestos-like fibers in drinking water from Lake Superior, improved techniques to identify spilled asphalts, ion-selective electrodes in water analysis, nutrient control at El Lago, Texas, research on a hazardous material spill in the Little Menomonee River, sanitary landfill leachate, and toxicology of at-mospheric pollutants associated with the use of automobile catalytic converters. (Knapp-USGS) W74-08309

ABSORPTION OF MERCURIC CATION BY TANNINS IN AGRICULTURAL RESIDUES, Agricultural Research Service, Berkeley, Calif. Western Regional Research Lab.

A. C. Waiss, Jr., M. E. Wiley, J. A. Kuhnle, A. L. Potter, and R. M. McCready.

Journal of Environmental Quality, Vol 2, No 3, p 369-371, July-September, 1973. 5 tab, 15 ref.

Descriptors: *Water pollution treatment, *Cation description, *Heavy metals, Mercury, Chelation, Oxidation, Reduction, *Absorption, Farm wastes. Identifiers: Agricultural residues.

common environmental pollutants are agricultural residues and waste streams of water containing only traces of heavy metals (such as mercury at 10 or more ppb) from mining or manufacturing operations. Agricultural residues contain tannins, polyphenolic substances, pectin, and other polymers -- all with chemically reactive groups that can chelate, reduce, oxidize, demonstrate ion exchange properties, and aid in removing traces of heavy metals from dilute waste water streams at low cost. Finely ground and waterwashed agricultural residues were slurried in water and packed into columns for absorption tests with heavy metals. Solutions of known concentrations of heavy metals were passed through the packed columns which were then eluted with water or with alkaline or acidic solutions. The fractions and the column absorbents were then analyzed by standard atomic absorption methods. The nature of the physical and chemical forces that are effective in metal absorption from agricultural residues is not clear. (Skogerboe-Colorado State)

CHEMICAL AND BIOCHEMICAL CONSIDA-TIONS FOR MAXIMIZING THE EFFICIENCY OF FERTILIZER NITROGEN,

Agricultural Research Service, Baton Rouge, La. For primary bibliographic entry see Field 5B. W74-08326

RECIPIENT CAPACITY TO DISCHARGE OF POLLUTANTS TO RECEIV-ING WATERS.

Bhabha Atomic Research Centre, Bombay (India). Health Physics Div. For primary bibliographic entry see Field 5B. W74-08351

PINCH VALVES TAKE HOLD ON THE INDUS-

Red Valve Co., Inc., Carnegie, Pa. For primary bibliographic entry see Field 8A. W74-08363

ENVIRONMENTAL INFORMATION SOURCES - ENGINEERING AND INDUSTRIAL APPLICA-TIONS: A SELECTED ANNOTATED BIBLIOG-RAPHY.

Massachusetts Inst. of Tech., Boston. James Madison Barker Engineering Library. For primary bibliographic entry see Field 10C. W74-08401

PULP, PAPER, AND BOARD IN THE EN-VIRONMENT -- PART 8: ENVIRONMENTAL

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

PROBLEMS OF THE WEST GERMAN PULP, PAPER, AND BOARD INDUSTRY.
Paper (London), Vol 179, No 9, p 513, 515, 529, May 2, 1973. 1 tab.

Descriptors: *Pulp and paper industry, Europe, Water quality control, *Pollution abatement, *Water pollution control, *Environmental control, Costs, Expenditures, Treatment facilities, Legisla-tion, Water law, *Regulation, Governments, *Waste water treatment, Air pollution, Water pollution sources, Government supports, Economics, Marketing, Competition, Competitive prices, Cost comparisons. Identifiers: *West Germany.

Problems of industrial water consumption and conservation, as well as pending legislations on waste water treatment and effluent discharges are discussed in general and with special reference to European and West German conditions. Environmental protection expenditures of the major West European countries are compared and found to be substantially higher (per ton of manufactured product) than in other Common Market countries. They are expected to increase by ca. 10% in the near-future as a result of public pressures and increasingly severe governmental regulations.
Governmental subsidies for pollution abatement facilities in various countries are contrasted, and their effects on international market competition are brought out. (Hansen-IPC)

PULP, PAPER, AND BOARD IN THE EN-VIRONMENT -- PART 9. POLLUTION ABATE-MENT IN THE FINNISH PULP AND PAPER IN-

Paper (London), Vol 179, No 9, p 521-522, May 2,

Descriptors: *Pulp and paper industry, Europe, Pollution abatement, Costs, Economics, Water quality control, *Waste water treatment, *Pulp wastes, Expenditures, *Sulfite liquors, Incineration, Waste water(Pollution), Industrial water, Water consumption(Except consumptive use), In-dustrial wastes, *Biochemical oxygen demand,

Water pollution sources.
Identifiers: *Finland, Kraft mills, Sulfite mills,
Hardboard mills, Forest products industries.

Finnish industrial investment in pollution control is dominated by the pulp and paper industry which consumes ca. 70% of the total water drawn from watercourses and discharges 88% of the total waste load (in terms of BOD). Large sums have been spent in recent years for pollution abatement by nearly all Finnish forest enterprises. Most Finnish sulfite pulp mills are now burning their waste liquors. Typical examples of environmental protection measures instituted by kraft, sulfite, and hardboard mills are cited. (Hansen-IPC)

CONCEPTS OF POLLUTION AND ITS CON-TROL,

Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).

W. Stumm, and E. Stumm-Zollinger. Technology Review, Vol 75, No 1, p 19-25, Oct/Nov 1972. 3 fig, 2 tab.

Descriptors: *Environmental control, Balance of Descriptors: "Environmental control, Balance or nature, "Pollution abatement, "Model studies, "Ecology, "Recycling, "Water pollution, "Air pol-lution, Water resources, Water manage-ment(Applied), Waste treatment, Watershed management, Resources, Land management, Evolus Expressions Production Ecology, Environment, Population.

A simple 'closed bottle' model of the terrestrial envelope (biosphere) has been used to demonstrate ecological constraints demand that human social and economic systems move toward a stationary state, where resources and materials are increasingly recycled. Present industrial development and its interference with natural relationships counteract the indigenous forces of hatural selection and may cause a partial and localized reversal in evolutionary trends. These conclusions are discussed and documented in some detail, with special reference to water and air pollution control. Water pollution control is seen as consisting not solely of waste treatment. Various physical and biological means of stream management may be directed towards restoring an ecological balance. Some examples of corrective measures are listed. The closed-bottle model makes it clear that zoning of land in the watershed, particularly the restriction of land use in the corridor adjoining the surface waters so as to give preference to diversified ecosystems with long food chains, is among the most powerful antipollution measures. (Brown-IPC) W74-08422

POLLUTION ABATEMENT IN EFFLUENTS FROM CONSTRUCTIONAL FIBERBOARD MANUFACTURE (Z BADAN NAD REDUKCJA OBCIZENIA SCIEKOW W PRZEMYSLE PLYT PILSNIOWYCH), For primary bibliographic entry see Field 3E. W74-08426

HOW SAFE ARE SEWERS FOR CONSTRUC-TION AND MAINTENANCE CREWS,

Howard, Needles, Tammen and Bergendoff, Inc., Indianapolis, Ind.

V. G. Wagner.
Deeds and Data (Water Pollution Control Federation), April 1974, p D1, D9, D12. 2 tab, 2 ref.

Descriptors: *Treatment facilities, *Safety, Accidents, Hazards, Labor, Manpower, *Operation and maintenance, *Sewers, Manholes, *Sewerage, Protection, Regulation

A three-year summation of accident statistics shows that the average frequency of worker injuries (ratio of disabling injury per million work hours) in water and sewage works is 25.78, which is over three times as high as in electric and gas utilities. Negligence is blamed for a major portion of these accidents, despite various existing regula-tions. Case histories are cited to demonstrate the need for prevention of cave-ins and better protec-tion of manhole workers. (Brown-IPC) W74-08440

TEST AND EVALUATION OF OIL POLLUTION ABATEMENT DEVICES FOR SHIPBOARD USE, PHASE 1, Coast Guard, Washington, D.C. Naval Engineer-

ing Div.

L. B. Norton, and F. Perrini. Available from NTIS, Springfield, Va. 22151, AD-762 498, Price \$3.75 printed copy; \$1.45 microfiche. March, 1972. 32 p, 5 fig.

Descriptors: *Oily water, *Water pollution treatment, *Oil spills, *Monitoring, Instrumentation, Equipment, Filters, *Separation techniques, Fil-

Tests were conducted on equipment designed to separate oil from water and to continuously detect oil in water. The principles of operation for the test separators were filter coalescence, gravity, com-bination gravity filter coalescence, and centrifugal bination gravity filter coalescence, and centritugal force. The gravity separator and centrifugal separators tested did not produce optically clear water effluents. Monitors utilizing infrared absorption, ultraviolet fluorescence and visible light scattering were tested. The monitors utilizing ultraviolet light exhibited lorge score forcester. traviolet light exhibited large errors from water soluble substances extracted from the test oils. Insoluble substances extracted from the test offis. frared adsorption monitors appear suitable for controlling filter coalescer operation using multi-ple oils. White light absorption indicators also ap-pear suitable. (Knapp-USGS)

W74-08450

WATER RESOURCES, ENVIRONMENT AND NATIONAL DEVELOPMENT--VOLUME I: SUMMARY OF PROCEEDINGS, AND VOLUME II: SELECTED PAPERS.

Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, 1972. 116 p (Vol I); 441 p (Vol II).

Descriptors: *Regional development, *Water pol-lution control, *Asia, *Conferences, Urbaniza-tion, Industrial wastes, Municipal wastes, Resources development. Identifiers: *Singapore, Malaysia, *Indonsia,

philippines.

Rapid industrialization has brought economic benefits to many people in Southeast Asia by providing them with jobs and a better livelihood. However, industrialization has also created the problem of pollution of the air and pollution of streams, rivers and seas. The problem of the en-vironment and national development is therefore a very complex one. While the technology for the production of marketable goods is very well developed, the technology for disposing of the wastes produced by the manufacturing processes is still in its infancy. This workshop was held to identify the problems of water resources in particular, and of the environment in general, in rela-tion to national development. (See W74-08455 thru W74-08485) (Knapp-USGS) W74-08454

GROUNDWATER INVESTIGATIONS IN SIN-

Singapore Public Utilities. Water Planning Unit. For primary bibliographic entry see Field 4B.

FLOOD CONTROL AND WATER CONSERVA TION WORKS IN BUKIT CATCHMENT, SINGAPORE,

Singapore Dept. of Public Works. Drainage and For primary bibliographic entry see Field 4A. W74-08456 Marine Branch.

HYDROLOGICAL ACTIVITIES IN SIN-

Singapore Dept. of Public Works. Drainage and Marine Branch. For primary bibliographic entry see Field 7C. W74-08457

THE REUSE OF SEWAGE EFFLUENT FOR IN-DUSTRIAL PURPOSES IN SINGAPORE Singapore Dept. of Public Works. Sewerage

For primary bibliographic entry see Field 5D. W74-08458

SOME FACTORS AFFECTING THE ANNUAL RAILFALL OF SINGAPORE. Singapore Meteorological Service.

For primary bibliographic entry see Field 2B. W74-08459

DEVELOPMENT OF WATER SUPPLY IN VIET-NAM, Ministry of Health, Saigon (Vietnam). Environ-

mental Sanitation Service. N. S. Tin.

In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17,

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

1972: Science Council of Singapore, p 84-86, 1972. I fig.

Descriptors: *Water supply, Water resources development, *Municipal water, Industrial water, Monsoons, Rainfall, *Potable water, *Water quali-ty, *Rural areas. Identifiers: *South Vietnam.

The water supply system of South Vietnam includes municipal water supply and rural water supply. The municipal water supply system is under the responsibility of the National Water Supply Agency, dating back to 1957. The cities of Saigon and Danang have their own Water Board. In rural areas, the Ministry of Health is responsible for water supply for villages and hamlets having a population of 5,000 or less. The Ministry of Health is responsible for the quality of drinking water and for stipulating water standards. In addition to quality control of drinking water, training courses for plant operators are organized. (See also W74-08454) (Knapp-USGS) W74-08460

MUNICIPAL WASTEWATER RECLAMATION AND REUSE, Camp. Dresser and McKee International. Inc...

Boston, Mass. For primary bibliographic entry see Field 5D. W74-08461

DIFFICULTIES IN PLANNING SUPPLY SCHEMES IN WEST MALAYSIA, Malaysia Dept. of Water Supply, Kuala Lumpur. For primary bibliographic entry see Field 6B. W74-08462

WATER RESOURCES DEVELOPMENT IN WEST MALAYSIA.

Drainage and Irrigation Dept., Kuala Lumpur, (Malaysia). For primary bibliographic entry see Field 3B. W74-08463

IMPROVED WATER MANAGEMENT FOR PADDY RICE PRODUCTION IN THE PHILIP-

National Irrigation Administration, M (Philippines). Water Management Project. For primary bibliographic entry see Field 3F. W74-08464

PLANNING FOR WATER REUSE.

North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5D.

RATIONAL USE OF WATER,

Ministry of Public Works and Electrical Energy, Djakarta (Indonesia). Water Resources Develop-For primary bibliographic entry see Field 6B.

W74-08466

SEWERAGE; SEWAGE TREATMENT AND DISPOSAL IN SINGAPORE. Singapore Dept. of Public Works. Sewerage

For primary bibliographic entry see Field 5D. W74-08467

DISPOSAL OF INDUSTRIAL TRADE EF-FLUENTS FROM THE FOOD INDUSTRIES, Singapore Inst. of Standards and Industrial Research.

For primary bibliographic entry see Field 5D. W74-08468

POLLUTION CONTROL OF DISCHARGES INTO RIVERS, STREAMS AND SEA,

BP Refinery Singapore Pty. Ltd. C. N. McColl.

In: Water Resources, Environment and National In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 189-191, 1972 2 tab

Descriptors: *Water pollution control, *Industrial wastes, *Oil industry, *Oil wastes, Waste treatment, Legislation, Regulation.

Apart from oil, refinery operations can produce other chemicals and pollutants. Steam condensate from stripping operations on crude distillation units can contain sulfides and phenols. Similar condensate from catalytic crackers can also con-tain cyanides, ammonia salts and higher concentrations of phenols. The effluent water from desalters contains sulfides, phenols and naphthenic acids. Legislation is necessary in order to provide a uniform code on pollution control for industries to conform to. The technical solutions to pollution problems are generally known, as are also the costs of overcoming or avoiding such problems. In an industrially competitive society the additional costs of achieving pollution control are eventually passed to the consumer. Realistic control limits are therefore needed. (See also W74-08454) (Knapp-W74-08469

AIMS OF WATER POLLUTION CONTROL.

Binnie and Partners, London (England). P. J. Norris.

In:: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 192-195,

Descriptors: *Water pollution control, *Public health, Economics, Water conservation, *Water supply, *Costs.

The aims of water pollution control are to ensure the availability of water for public supply, to eliminate health risks and to preserve amenities. Water pollution is being reduced in many countries and the measures needed to bring it under control are well established. The cost is the limiting factor and is likely to continue to be so for many years. In England it is proposed to increase by over 50% the present outlay on new pollution control measures in the next five years, resulting in much higher capital expenditure than is being allocated to new water supply projects. (See also W74-08454) (Knapp-USGS) W74-08470

THE SLOP OIL PROBLEM IN SINGAPORE,

Ministry of Science and Technology, Singapore. Industrial Liaison Unit. W. P. S. Tan.

In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 196-211, 1972. 5 fig, 3 tab, 2 append.

Descriptors: *Oil spills, *Oily water, *Water pollution control, *Ships, Water pollution sources. Identifiers: *Singapore, Oil tankers.

Slop oil is the oily water resulting from tank cleaning operations from ocean-going tankers. At this moment over 3,300 tankers totaling 177 million deadweight tons are plying the oil routes of the world. On an average of one a year to eighteen months, these tankers are docked for inspection and repairs. Safety ordinances require their tanks to be cleaned, gas freed and the slop discharged before the tankers can be docked or berthed shore reception facilities do not exist, half a million tons of oil would be discharged into the seas from repairing tankers alone. Including normal tanker operations, accidents, and the discharge from ships bilge, the total oil spill (from ships) could come to over a million tons per year. By 1975 Singapore will be repairing nearly 20% of the world's tankers. Reception facilities start with the provision of wharves suitable for berthing superprovision of whatves suitable for certaing super-tankers in ballast condition. The oil is recovered from the slop and stored for final disposal or reuse. (See also W74-08454) (Knapp-USGS) W74-08471

THE CONTROL OF WASTEWATER AND OIL DISCHARGES TO THE SEA WITH PARTICULAR REGARD TO STUDIES RECENTLY CAR-RIED OUT IN SINGAPORE'S SOUTHERN COASTAL WATERS,

Watson (J. D. and D. M.), London (England).

J. R. Preston.

In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 212-223, 1972 2 fig

Descriptors: *Water pollution control, *Oil spills, *Sewage disposal, Waste water treatment, Sanitary engineering. Identifiers: *Singapore.

Pollution in waste water can be described and quantified by suspended solids, biochemical ox-ygen demand, coliform bacteria, oils and greases, heavy metals and other toxics, and nutrient concentrations. The standards commonly associated with waste-water discharges into inland waterways are compared with standards which might be upheld for marine discharges, taking health, amenity, fishing and shipping into account. The difficulties in quantifying ecological factors and the importance of such factors in enclosed waterways are discussed. Marine investigations recently carried out in Singapore's southern waters are summarized and related to the general parameters of water pollution. Singapore has an efficient method for dealing with emergency spills. Floating booms, skimming devices, and detergents are available in the Republic, and they can be brought quickly into use in the event of an emergency. (See also W74-08454) (Knapp-USGS) W74-08472

PETROLEUM REFINERY EFFLUENT QUALI-TY CONTROL, Esso Research and Engineering Co., Linden, N.J.

For primary bibliographic entry see Field 5D. W74-08473

THE HANDLING OF OIL SPILLS,

Esso Research and Engineering Co., Linden, N.J.

In: Water Resources, Environment and National In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 231-237, 1972. 14 fig.

Descriptors: *Oil spills, *Oily water, *Water pollution treatment, Water pollution sources, Water pollution control.

The effectiveness of oil spill cleanup is signifi-cantly influenced by environmental conditions at the spill area and the degree of preparedness that

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

has been achieved. Anticipated problems are defined, based on historical data from past incidents, in terms of spill size, location, type of oil involved, and wind and sea conditions. The characteristics of the oil spilled, the location and extent of the spill, and existing environmental factors influence the decisions on how an oil spill should be handled. Containment, confinement, removal and disposal are commonly used for con-trol and recovery of spilled oil. Current rate of the art involving equipment and materials for removing oil from the surface of water is reviewed. Included in the discussion are booms, sorbent materials, chemicals and skimming devices. The basic requirements of preplanning and subsequent development of effective contingency plans are discussed. In the event containment and removal are not feasible, the role that chemical dispersion can play in minimizing and/or mitigating the harmful effect of the spilled oil is outlined. (See also W74-08454) (Knapp-USGS) W74-08474

SEA POLLUTION IN SINGAPORE.

Port of Singapore Authority. For primary bibliographic entry see Field 5B. W74-08475

OF THE RELATIONSHIP PHYTO-PLANKTON DISTRIBU-TION AND PHOSPHATE LEVELS.

Singapore Primary Production Dept For primary bibliographic entry see Field 5C.

RESEARCH ON THE CULTURE OF CERTAIN COMMON MARINE ORGANISMS IN SIN-GAPORE WATERS,

Singapore Univ. Fisheries Biology Unit. For primary bibliographic entry see Field 3F. W74-08477

DEVELOPMENT OF BLUE-GREEN ALGAL BLOOMS IN NON-ALKALINE WATERS,

Singapore Univ. Dept. of Zoology. For primary bibliographic entry see Field 5C. W74-08478

WATER POLLUTION AND ENVIRONMENTAL HEALTH.

Ministry of Health, Kuala Lumpur (Malaysia). A. Sekarajasekaran.

In: Water Resources, Environment and National In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 268-271,

Descriptors: *Water pollution control, *Legislation, Urbanization, Environmental sanitacontrol. tion, Public health, Land use, Manpower, Train-

Identifiers: *Malaysia.

Urbanization, industrialization and land develop-ment in West Malaysia have been growing at a rapid rate. Existing legislation was designed to cope with special problems as they have arisen and was designed on the basis of expediency to try to eliminate some of the gross and obvious nuisance problems. This legislation has failed to control pol-lution and this has been due to inability to recruit and train adequate technical staff to carry out knowledgeable implementation. Comprehensive water quality control legislation should be coordinated with an overall environmental quality control enabling act. Such legislation must include provision for recruitment and training of adequate staff and other factors relating to implementation. (See also W74-08454) (Knapp-USGS)

CONTROL OF INDUSTRIAL TOXICITY

TOXICITY CONTROL OF INDUSTRIAL WASTEWATERS AND PESTICIDE-POLLUTED WATERS IN VIETNAM, Institut Pasteur du Vietnam, Saigon. Dept. of Water Sanitation and Toxicology. For primary bibliographic entry see Field 5C.

IMPROVEMENT OF SOIL COVER FOR WATER CONSERVATION, PREVENTION OF SEDIMENTATION AND POLLUTION CONTROL IN THE PHILIPPINES,

National Inst. of Science and Technology, Manila (Philippines). Div. of Agriculture and Natural Resources Research.

N. Laudencia

P. N. Laudencia.

In: Water Resources, Environment and National Development--Volume II: Selected Papers, Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 277-285, 1972. 1 fig, 12 ref.

Descriptors: *Water pollution control, *Sediment control, *Erosion control, Land management, Forest management, Productivity, Fisheries, Turbidity. Sedimentation. Identifiers: *Philippines.

Surface water resources in the Philippines are being clogged with sediments and soil deposits or are heavily polluted to the extent that only a few species of fish remain. Water turbidity caused by suspended fine particles carried by runoff water diminishes the population of phytoplankton which serve as food for fish. Suspended fine particles also suffocate fish by clogging their gills. Rivers and streams which used to be the source of potable water in the rural areas are becoming useless for such purpose. One activity by the Philippine Government which may help alleviate the worsening condition of surface water resources is the improvement of the soil cover designed to minimize water erosion, sedimentation and pollution. This is being accomplished through improvement of agricultural practices, engineering measures, and forest protection and reforestation. Research on planting of cover crops, pasture improvement and selection of fast-growing reforestation tree species which are also utilizable for pulp and paper manufacture is described. (See also W74-08454) facture is described. (See (Knapp-USGS) W74-08481 also

POLLUTION CONTROL OF DISCHARGE INTO RIVERS, LAKES AND COASTAL WATERS IN THE PHILIPPINES,
National Water and Air Pollution Control Com-

mission, Manila (Philippines).

R N Garcia

In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 286-292,

Descriptors: *Water pollution control, *Industrial wastes, Waste treatment, Regulation, Legislation, Water quality, Water pollution sources, Water pollution effects. Identifiers: *Philippines.

Pollution control of discharge into rivers, lakes and coastal waters in the Philippines is vested by law under the National Water and Air Pollution Control Commission. Due to varied usage and location of different streams, lakes or other bodies of water, classification of bodies of water has to be based on their best usage. The water quality standard adopted is the basis for determining the degree of wastewater treatment required. (See also W74-08454) (Knapp-USGS)

WATER POLLUTION IN THAILAND, Applied Scientific Research Corp., of Thailand. Bangkok. Environmental and Ecological Research Inst.

S. Ratasuk

In: Water Resources, Environment and National In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 293-307, 1972. 2 fig, 1 tab, 6 ref, 3 append.

Descriptors: *Water pollution sources, *Water pollution control, Industrial wastes, Municipal wastes, Water pollution effects. Identifiers: *Thailand.

Water pollution is the most serious environmental problem in Thailand since a great percentage of people rely on surface waters for their daily living. Water pollution is a potential health hazard and it also damages fisheries, agriculture, and aesthetic value of the water. Serious problems of water pollution are experienced in Greater Bangkok and in a few areas of the country. Urban canals in Greater Bangkok, the Chao Phraya River, the Mae Klong River, and a number of streams in Chonburi are severely polluted. The condition of the Tachin River is also deteriorating. In the Greater Bangkok area, the most densely populated and heavily in-dustrialized part of the country, domestic wastes and industrial wastes are responsible for the water pollution. In other areas, industrial wastes are the main cause. Organic pollution with depletion of dissolved oxygen is the most common nature of water pollution. Existing laws and regulations in Thailand concerning water pollution and waste-water discharges and neither clearly defined nor appropriate for the present situation. Their revion, amendment, and strong enforcement are indispensable for protecting the country's water resources. (See also W74-08454) (Knapp-USGS) W74-08483

SUMMARY REPORT ON POLLUTION CON-TROL IN INDONESIA,

Ministry of Public Works and Electrical Energy, Djakarta (Indonesia). Planning and Urban

Development.
A. Aziz Sasmitadihardja.

A. Aziz Sasmitadinardja.

In: Water Resources, Environment and National

Development--Volume II: Selected Papers;

Proceedings of Regional Workshop by Science

Council of Singapore and National Academy of

Sciences of the USA, Singapore, March 13-17,

1972: Science Council of Singapore, p 308-320, 1972. 3 append.

Descriptors: *Water pollution control, *Water pollution sources, *Urbanization, Water pollution effects, Municipal wastes, Industrial wastes, Waste disposal

Identifiers: *Indonesia

The size of Indonesia and its large population constitute major problems for economic development, including water management and its pollution control. There are about 124 million population in Indonesia, unevenly distributed over an Archipelago extending 3,200 miles west to east and 1,000 miles north to south. The islands of Java and Madura have 65% of the total population. Of the population about 100 million are rural. Rapid urbanization and industrialization in large cities are causing serious water pollution problems which result in major public health hazards and the general deteri-oration of natural water resources. In the city of Djakarta, a water pollution committee for the formulation of water pollution legislation was established in 1970 to cope with the problem. Steps ave been taken in recent years through legisl tion, education, and research to deal with domestic trade and farm wastes. The problem has always been the lack of technical know-how and financial resources. (See also W74-08454) (Knapp-HSGS)

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Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

SEA POLLUTION-SOME ASPECTS AND THE NEED TO FIGHT IT.

Indonesian Petroleum Inst., Djakarta. For primary bibliographic entry see Field 5B. W74-08485

EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL. VTN, Orlando, Fla.

For primary bibliographic entry see Field 5E. W74-08486

EROSION CONTROL AND BANK STABILIZA TION IN METROPOLITAN TORONTO--10 YEAR PROGRAMME AND 5 YEAR PROJECT. Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario).

For primary bibliographic entry see Field 4D. W74-08488

HONOLULU BOARD OF WATER SUPPLY AN-NUAL REPORT FOR THE YEAR ENDED JUNE 30, 1973.

Board of Water Supply, Honolulu, Hawaii. 1973, 24 p, 1 fig, 7 tab, photos.

Descriptors: *Hawaii, *Water supply, Water management, *Water delivery, *Water costs, *Water development, Pumping, Research and development, Chlorination, Computers, Operations, Financing, Annual, Annual costs, Bond is-

tions, Financing, Annual, Annual, sucs, Reservoir design.
Identifiers: Assets, Liabilities, *Honolulu(H.I.), Annual report.

Management of the sewer system was transferred from the city of Honolulu to the Board of Water Supply, and charges are to be assessed to sewer users in order to make the system self supporting. Pumpage increased to 26.3 mgd, an increase of 8.6 A research program was continued to determine the efficacy of using chlorinated effluent for the irrigation of sugar cane. Other research included the study of a 50 mgd construction project, and the computerization of consumption data. Microbiological testing of samples of municipal supply showed coliform densities well below the maximum allowed by USPHS, and pesticide and mercury monitoring showed no contamination. \$5.5 million was spent in engineering construction, and a GMG reservoir design nears and completion. Main chlorination is done by 59 tap-ins. Water sales were \$16,648,394, up \$1,055,065. \$8.5 million in General Obligation Water Bonds series 1973 were issued with a net interest rate of 5.0677%. Assets and liabilities were \$147,872,305, the liabilities including \$16,745,434 of retained earnings reinvested in the system. (LaPointe-North Carolina)

WATER AND SEWER SUPPLY DECISIONS: A CASE STUDY OF THE WASHINGTON SUBUR-BAN SANITARY COMMISSION,

Virginia Univ., Charlottesville. F. X. Tannian.

PhD Dissertation. June, 1965. 209 p, 2 fig, 14 tab, 109 ref, 1 append.

Descriptors: *Land use, *Planning, *Water supply, *Sewerage, Costs, *Financing, Prices, *Pricing, *Maryland, Political aspects, Sewage treatment, Sewage disposal, Distribution systems, *District of Columbia, *Virginia.

Identifiers: Conflict of interest, Utility extension, Prince Georges County(Md.), Montogomery County(Md.)

County(Md.)

The water supply decisions and performance of the Washington Suburban Sanitary Commission in Prince Georges and Montgomery Counties, Maryland, are analyzed with an emphasis on pricing policies and their implications, and the impacts of subsidies and inequities which result from average cost pricing and special rate structures. The relationships and cost interactions between water and sewer service caused by common reliance of both functions on rivers is established. Relationships of the Sanitary Commission to the residential construction and finance industries, to other local government agencies, as well as to its own announced investment program, and to the private interests of the Commissioners are outlined by tracing through a series of decisions to extend sewer lines. Among the study's conclusions are: (1) the agency allies itself with local and regional interests and organizations representing those who will benefit from WSSC decisions; (2) the special interests decision making of WSSC on investment and operation is geared to help the construction industry leapfrog to less costly land, generating a land use called sprawl. Also multiple average cost pricing by the Commission provides the financial subsidies needed to support leapfrog lines and sprawl; (3) the more land which subsidized sewer and water systems can reach, the more development can take place; (4) many of the Commissioners themselves stand to profit by WSSC's decisions; (5) most of the practices of the Commisadecisions; (3) most of the practices of the Commission serve to conceal these effects from the public; and (6) provisions of sewer and water supplies through the Sanitary Commission's institutional structure has induced misuse of public power by private initiative. (Edwards-North Carolina) W74-08497

SYSTEMS PLANNING DESIGN: CASE STUDIES MODELING, OPTIMIZATION, EVALUATION.

Massachusetts Inst. of Tech., Cambridge. Center for Transportation Studies.
For primary bibliographic entry see Field 6A.
W74-08506

ENVIRONMENTAL IMPACT STATEMENTS. Datatronic Systems Corp., Panorama City, Calif. For primary bibliographic entry see Field 6G.

THE IMPACT OF GROWTH ON THE EN-VIRONMENT.

For primary bibliographic entry see Field 6G. W74-08523

EFFLUENT CHARGES ON AIR AND WATER POLLUTION.

Environmental Law Inst., Washington, D.C. E. I. Selig.

Monograph Series 1, October 15 and 16, 1971. 102 p, 106 ref, 3 append.

Descriptors: *Regulation, *Adoption of practices, *Administration, *Water pollution sources, *Economic aspects, Economics, Project planning, Feasibility, Decision making, Cost-benefit analysis, Water quality control, Waste water treatment, Industrial waste, Specifications, Monitoring, Direct costs, Direct benefits, Water conservation, Legal aspects, State governments, Federal Government, Inspection, Natural resources, Standards

Identifiers: *Administrative regulations

Various plans for effluent charges or charge substitutes looked at by this conference all reflected disappointment with current regulatory efforts to control water pollution. Some planners thought control water pollution. Some planners thought direct regulation could be reinforced by supplementary charges. Three plans presented provided for statewide charges and two plans provided for national charges on water pollution. This would supplement existing law where polluters are usually required to meet effluent or equipment standards by deadline dates. Effluent standards reincompatible with effluent charges over the are incompatible with effluent charges over the same ranges of potential waste reduction from an economic view of efficient allocation of resources. From that perspective each polluter must determine what level of charges he could withstand

while seeking a least cost situation. It was suggested that pollution might be free below a certain threshold and prohibited above a certain ceiling. Pollution between the two levels would be subject to effluent charges. This system could be effective to forestall cumulative effects of pollution which ambient standards do not take into account. Also it would be effective to control localized effects for which single polluters may be mainly responsible. (Sperling-Florida) W74-08524

WATER POLLUTION: ECONOMIC ASPECTS

AND RESEARCH NEEDS,
Resources for the Future, Washington, D.C. A. V. Kneese.

Published by Johns Hopkins Press, Baltimore, 1962, 107 p, 106 ref, 1 append.

Descriptors: *Water requirements, *Water resources, *Water management(Applied), *Water utilization, Environmental sanitation, Economic aspects. Water conservation. Waste water treatment, Water costs, Federal Government, resource development, Water yield, Project planning, Water supply, Water treatment, Water quality, Water pollution, Water pollution sources, Industrial waste, Flow augmentation, Water quali-ty control, Evaporation, Evapotranspiration, Water reuse, Consumptive use. Identifiers: Hazardous substances(Pollution).

Early projections of national water requirements failed to consider that water use is not completely consumptive. Later projections overreacted to this error in ascribing water consumption almost entirely to evaporation and transpiration. However, other changes resulting from water use may have a similar effect. The first comprehensive projection of water requirements specifically included requirements for pollution abatement. A larger share of water will be devoted to providing dilution for industrial and domestic wastes than will be consumed by evaporation and transpiration. This conclusion was based on the assumption that current ratios of wastes produced to population and economic activity would continue. It was also assumed that standard biological treatment and augmentation of low stream flows for waste dilution would be the only devices used to deal with pollution loadings. A minimum cost combination of flow augmentation and treatment would require an additional abatement investment of one hundred billion dollars by the year 2000. (Sperling-Florida) W74-08525

ADVERSE EFFECTS OF COAL MINING ON FEDERAL RESERVOIR PROJECTS.

Hearing-Subcomm of the Comm on Government Operations, 93rd Cong, 1st Sess, U.S. House of Representatives, October 25, 1973. 634 p, 4 map,

Descriptors: *Coals, *Coal mines, *Coal mine wastes, *Water pollution sources, *Appalachian wastes, *Water pollution sources, *Appalachian Mountain region, Water pollution, Water pollution control, Sediments, Sedimentation, Permits, Environment, Environmental effects, Navigable waters, Pollution abatement, Administrative agencies, Regulation, Investigation, Federal Govern-ment, Reservoirs, Water resources, Water resources development, Industrial wastes. Identifiers: Congressional hearings

These hearings were held by the Subcommittee on Conservation and Natural Resources to inquire as to what actions are being taken by various federal agencies, such as the Corps of Engineers and the Environmental Protection Agency (EPA), to protect the nation's waterways and federal reservoirs from the adverse effects of surface and deep coal mining. In January 1972, the subcommittee in-itiated an investigation into Corps of Engineers policies and procedures for protecting its multimillion dollar reservoir projects from the adverse effects of coal mining in Appalachia. The in-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

vestigation showed that Fishtrap Lake in Eastern Kentucky had been extensively damaged by coal mining operations. In September 1972, the Corps was ordered to publish regulations to prevent such effects on other mining sites. Failure to do so led to a request by the subcommittee that the General Accounting Office (GAO) conduct a similar investigation. Recommendations by the GAO followed, but the Corps has still not implemented them and the purpose of these hearings was to determine the reasons for this nonfeasance. In addition, the subcommittee investigated the issuance of permits to discharge wastes into navigable waterways by the EPA with no requirement that the coal operator remove from navigable waterways the sediment deposits resulting from the min-ing work. (Ritchie-Florida) W74-08528

PROGRESS EVALUATION MEETING IN THE MATTER OF POLLUTION OF THE INTERSTATE WATERS OF THE MISSOURI RIVER, OMAHA, NEBRASKA AREA (NEBRASKA-IOWA-MISSOURI-KANSAS). Federal Water Pollution Control Administration,

Washington, D.C. March 8, 1967, 114 p, 1 map.

Descriptors: *Governmental interrelations, *Missouri River, *Comprehensive planning, *Water supply, *Water pollution treatment, Water resources development, Political aspects, Interstate rivers, River basin development, Planning utilities, Rivers, Filtration, Oily water, Pollutants, Sewage treatment, Waste water treatment, Water purification, Water quality, Water pollution con-

Representatives of the United States Department of the Interior as well as representatives of Iowa, Kansas, Missouri, Nebraska, and various cities on the Missouri River, met to evaluate their progress in controlling pollution of the waters of the Missouri in the Omaha, Nebraska area. This verbatim transcript of the proceedings records the con-ferees' reports of their pollution control activities. Discussion centered principally on grease removal from the discharge of meat packing plants and the creation of the Omaha Pollution Control Corporation. (Craig-Florida) W74-08529

REPORT ON THE SECOND SESSION OF THE CONFERENCE IN THE MATTER OF POLLUTION OF THE SOUTH PLATTE RIVER BASIN. Federal Water Pollution Control Administration,

Washington, D.C. April 27, 1966, 126 p, 27 fig, 11 map, 3 photo, 15 tab, 2 append.

Descriptors: *Colorado, *Water pollution, *Municipal wastes, *Industrial wastes, *Water quality standards, Water quality, Recreation, Agriculture, ground water, Water supply, Pollution abatement, Sewage treatment, Waste treatment, Fisheries, Flow augmentation, Water quality control, Irrigation, Water utilization, Coliforms, Biochemical oxygen demand, Solid wastes, Rivers. Identifiers: *South Platte River(Colo).

The principal present water uses in the South Platte River Basin in central Colorado are agricultural, irrigation and industrial. If water quality is considerably improved, the waters can also be used for municipal water supply, recreation, establishment of a warm-water fishery and aesthetic enjoyment. Based on the present interferences with water uses resulting from discharges of untreated and inadequately treated municipal and industrial wastes, specific pollution abatement measures must be provided as well as programs for flow augmentation during periods of low flow. The waters at the present time are grossly polluted and significant contamination exists in portions of the shallow groundwater aquifer. Project findings

show that coliform densities greatly exceed accepted standards., oxygen demanding wastes have resulted in near septic conditions, suspended and settleable solids have destroyed desirable aquatic life, and pollution of the South Platte River has af-fected groundwater supplies. In order to attain water quality objectives, municipalities and in-dustries must be required to treat their raw wastes with ninety percent efficiency. (Ritchie-Florida)

DEFINITION OF CRITICAL COASTAL AREAS AND APPROACHES TO STANDARDS FOR MANAGEMENT, South Carolina Wildlife and Marine Resources

Dept., Charleston.

For primary bibliographic entry see Field 2L. W74-08532

MUNICIPAL POWERS UNDER FLIRIDA LAW WITH RESPECT TO PROTECTION OF EN-VIRONMENTALLY ENDANGERED RIPARIAN

Miami Univ., Fla. Ocean Law Program. For primary bibliographic entry see Field 6E. W74-08534

UTAH ENVIRONMENTAL PROBLEMS AND LEGISLATIVE RESPONSE: II, LEGISLATIVE RESPONSE, Environmental Protection Agency, Denver, Colo.

Region VIII.
J. W. Raisch.

Utah Law Review, p 1-28, Spring 1972. 29 p, 255

Descriptors: *Utah, *Legislation, *Environmental control, *Water pollution control, *Regulation, *Federal Water Pollution Control Act, Water law, Permits, Public health, Penalties(Legal), State Permits, Public health, Penalties(Legal), State governments, Water pollution, Pollution abate-ment, Industrual wastes, Municipal wastes discharge(Water), Effluents, Water pollution con-trol, Water quality control, Water quality stan-

Utah's environmental programs are examined in detail. The Division of Health of the Department of Social Services has responsibility for enforcement of Utah's environmental laws. The principal water pollution control statute is the Pollution of Waters Act (Act). The author examines the various sections of that act and criticizes its deficiencies. The fulcrum of the Act is the creation of a nine-member Committee on Water Pollution, six of which must represent specific interests. The author, highly critical of this provision, suggests the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) may force a change in the composition of the Committee. The Act creates a discharge permit program, although it requires revision to comport with FWPCA requirements. The Act also authorizes the Committee to group the waters of the state into classes, according to their present most reasonable use. The several entheir present most reasonator use. The several en-forcement provisions of the Act are also ex-amined, as well as the provision for judicial review. The author's final suggestion is that responsibility for administration of the state's en-vironmental programs be placed in a single agency other than the health oriented Divisions of Health other than the health oriented Division of Health. (Craig-Florida) W74-08535

STATE OF WASHINGTON, 1973 ANNUAL RE-PORT, NATURAL RESOURCES AND RECREA-TION AGENCIES.

For primary bibliographic entry see Field 6E. W74-08536

ENVIRONMENTAL POLICIES AS A CONGRESSIONAL REQUIREMENT FOR SOCIAL EFFICACY,

Committee on Public Works (US-Senate).

For primary bibliographic entry see Field 6E.

NEW LAWS: CLEAN WATERS IN THE NEXT

Army War Coll., Carlisle Barracks, Pa. Douglas L. Haller.

Available from NATIONAL Technical Information Service, Springfield Va. 22151, as AD-761 050, for \$3.75 paper copy, \$1.45 microfiche. February 23, 1973, 75 p.

Descriptors: *Pollution abatement, *Water pollu-tion treatment, *Federal government, *Water quality control, *Waste water treatment. *Federal Water Pollution Control Act, Inter-agency cooperation, Regulations, Grants, Mine water, Lake Erie, Lakes, River basins, Research and development, Pollutant identification, Inspection, Government finance, Sludge treatment, Effluents, Oily water, State governments, Treatment facili-ties, Supervisory control, Water resources development, Water policy. Identifiers: *Water Pollution Control Act.

The scope of the Federal Water Pollution Control Act has been enlarged by the amendments of 1972. This Act represents an evolution from a program to control water pollution to one whose objective is to eliminate water pollution. The complexities and overlapping areas of responsibility require the federal government to assume the dominant role in planning, funding and standards of enforcement. However, maximum use is made of state, in-terstate and municipal authorities in administering the many facets of the water pollution program. The 1972 amendments establish statutory deadlines for meeting graduated standards that will require massive amounts of industrial, federal and local funds. The 1972 Act shifts from ambient water quality standards to employment of effluent limitations. It also requires all polluters to obtain permits and install monitoring equipment which is subject to authorized federal or state inspection. The federal government is no longer required to go through the conference, hearing and court procedure to enforce the water pollution standards. Substantial fines can be imposed on violators of the Act. The federal government may take control of state programs from states which fail to enforce standards or misuse permit authority (Kelly-Florida) W74-08542

FINAL REPORT ANALYZING COASTAL AND MARINE LAW TO DEVELOP AN AUTHORITY FOR COASTAL ZONE MANAGEMENT, Texas Law Inst. of Coastal and Marine Resources.

Houston. For primary bibliographic entry see Field 6E. W74-08544

ENVIRONMENTAL LAW-WATER POLLU-TION-CONFLICT BETWEEN REFUSE ACT PERMIT PROGRAM AND NATIONAL EN-VIRONMENTAL POLICY ACT, F. Rasmussen.

Wisconsin Law Review, Vol 1973, p 280-290, 1973. 11 p. 90 ref.

Descriptors: *Environmental effects, *Federal Water Pollution Control Act, *Permits, Water Pollution Control Act. *Permits, *Legislation, *Judicial decisions, Legal review, Federal government, Federal jurisdiction, Pollution abatement, Pollution control, Environmental control, Rivers, Navigable waters, Navigable rivers, Water quality standards, Water pollution, Impaired water quality, Discharges(Water), Administrative agencies.

Identifiers: *National Environmental Policy Act,

Environmental impact statement, *Refuse Act

The conflict between the Refuse Act Permit Program and the National Environmental Policy Act exemplified by a recent federal case is analyzed.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

On December 23, 1970 the President announced a program to initiate the permit provisions of the Refuse Act and the Secretary of the Army published proposed regulations to implement the executive order. These were challenged for non-compliance with the National Environmental Policy Act as they applied to navigable and nonnavigable streams. The court in the subject case enjoined the issuance of permits, pending amendment of the regulations to require environmental impact statements. This was apparently desireable because the proposed program would have weakened the federal statutory basis for con-trolling water pollution. Moreover, the Federal Water Pollution Control Act Amendments of 1972 moots the case by incorporating a permit program, exempt from the National Environmental Policy Act, into the Federal Water Pollution Control Act and these amendments set water quality standards. (Whisler-Florida) W74-08550

A BILL TO PRESERVE AND PROMOTE THE RESOURCES OF THE CONNECTICUT RIVER

For primary bibliographic entry see Field 6E. W74-08553

POLLUTION PROHIBITED ZONES --REGULATIONS.

For primary bibliographic entry see Field 6E. W74-08555

VESSELS IN FOREIGN AND DOMESTIC TRADES--POLLUTION OF COASTAL AND NAVIGABLE WATERS. For primary bibliographic entry see Field 6E.

W74-08556

POLLUTION PREVENTION VESSEL AND OIL TRANSFER FACILITIES.

For primary bibliographic entry see Field 6E. W74-08558

POLLUTION PREVENTION INSPECTION OF VESSELS AND DECK AND ENGINEER OF-FICERS' LICENSES.

For primary bibliographic entry see Field 6E. W74-08559

STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION IN THE NATIONAL POLLUTANT DISCHARGE ELIMINATION

For primary bibliographic entry see Field 6E. W74-08560

OIL POLLUTION PREVENTION--NON-TRANS-PORTATION-RELATED ONSHORE AND OFFSHORE FACILITIES--PROPOSED RULES. For primary bibliographic entry see Field 6E. W74-08561

POLLUTION OF COASTAL AND NAVIGABLE WATERS (CFR TITLE 19, PART 4). For primary bibliographic entry see Field 6E.

INTERIM POLICY STATEMENT ON IMPLE-MENTATION, FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972. For primary bibliographic entry see Field 6E. W74-08563

NATIONAL OIL AND HAZARDOUS SUB-STANCES POLLUTION CONTINGENCY PLAN. For primary bibliographic entry see Field 6E. W74-08564

POLLUTION CONTROL--WHO PUTS THE DIRT IN THE DRINKING WATER. For primary bibliographic entry see Field 6E. W74-08565

MEMORANDUM OF UNDERSTANDING RE-GARDING IMPLEMENTATION OF CERTAIN COMPLEMENTARY RESPONSIBILITIES--NOTICE.

For primary bibliographic entry see Field 6E. W74-08566

OIL POLLUTION ACT AMENDMENTS OF 1973--LEGISLATIVE HISTORY. For primary bibliographic entry see Field 6E. W74-08567

AND POLLUTION ORSTRUCTION OF WATERS. For primary bibliographic entry see Field 6E. W74-08569

WATER AND SEWERAGE DISPOSAL AGEN-

CIES, For primary bibliographic entry see Field 6E. W74-08571

STATE V BISHOP (ACTION FOR PUBLIC NUISANCE AND TREPASS IN FILLING AREA BELOW HIGH WATER MARK OF BAY). For primary bibliographic entry see Field 6E. W74-08573

MINING ACT OF 1971. For primary bibliographic entry see Field 6E. W74-08575

WATER POLLUTION CONTROL FACILITIES --TAX EXEMPTION.

For primary bibliographic entry see Field 6E. W74-08577

AIR AND WATER POLLUTION CONTROL PERMIT BOARD. For primary bibliographic entry see Field 6E.

OPERATION OF MINES.

W74-08579

For primary bibliographic entry see Field 6E. W74-08580

SELECTIVE WITHDRAWAL FROM MAN-MADE LAKES, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 4A. W74-08585

SOLUBILITY OF 1,1,2,2-TETRABROMOETHANE IN WATER AS A FUNCTION OF TEMPERATURE, Bureau of Mines, Tuscaloosa, Ala. Tuscaloosa Metallurgy Research Lab. For primary bibliographic entry see Field 5B. W74-08589

GEOLOGY AND WATER RESOURCES OF THE GIRDWOOD-ALYESKA AREA, ALASKA, Geological Survey, Anchorage, Alaska, For primary bibliographic entry see Field 4B. W74-08595

THE MICROBIAL DEGRADATION OF OIL POLLUTANTS, Louisiana State Univ., Baton Rouge. Center for Wetland Resources

For primary bibliographic entry see Field 5B. W74-08609

MICROBIAL-FACILITATED DEGRADATION OF OIL: A PROSPECTUS. Georgia State Univ., Atlanta. Dept. of Biology. For primary bibliographic entry see Field 5B.

MICROBIAL DEGRADATION OF OIL: PRESENT STATUS, PROBLEMS, AND PERSPECTIVES,

Scripps Institution of Oceanography, La Jolla, Calif.

For primary bibliographic entry see Field 5B. W74-08611

SEEDING BACTERIAL TO ENHANCE BIODEGRADATION OF OIL SLICKS, Texas Univ., Port Aransas, Marine Science Inst. For primary bibliographic entry see Field 5B.

COASTAL ECOSYSTEMS. ECOLOGICAL CONSIDERATIONS FOR MANAGEMENT OF THE

Conservation Foundation, Washington, D.C. For primary bibliographic entry see Field 2L. W74-08642

CONTROL OF MINE DRAINAGE FROM COAL MINE MINERAL WASTES: PHASE II. POLLU-TION ABATEMENT AND MONITORING. Consolidation Coal Co., Pinckneyville, Ill. Mid-

western Div. Z. V. Kosowski.

W74-08610

W74-08641

Available from Sup Doc, GPO, Washington, D.C. 20402, Price \$1.25 paper copy. Environmental Protection Agency Technology Series Report EPA-R2-73-230, May 1973. 83 p. 10 fig. 7 tab. 3 ref, append.

Descriptors: *Water pollution control, *Coal mine wastes, "Mine acids, Methodology, "Vegetation establishment, Erosion control, Controlled drainage, Lagoons, Costs, Land reclamation, "Illinois, "Waste water treatment.

Acid runoff from coal mining refuse piles can be controlled by covering the mineral wastes with soil, establishing a vegetative cover, and providing adequate drainage to minimize erosion. The average acid formation rate for the entire restored refuse pile was estimated at 16 lb acid as CaCO3/acre/day, or a reduction of 91+% when compared to the original unrestored pile. No significant differences were observed in acid formation rates from the three individual test plots covered with a nominal 1 foot, 2 feet, or 3 feet of soil. Slurry lagoons containing the fine coal rejects can be stabilized and the air pollution problem controlled by either a vegetative cover established directly on the mineral wastes without soil or by the application of a chemical stabilizer. Chemical stabilization is only a temporary measure, and vegetative covers should be the permanent solution to slurry lagoons. Cost data from this project indicate that it would cost approximately \$6,100, \$8,000, and \$9,800 per acre to establish a grass cover on an abandoned refuse pile using 1, 2, and 3 feet of soil respectively. (See also W72-03785) (Woodard-USGS) W74-08661

SALT-WATER INTRUSION AND ITS CON-TROL.

California Univ., Berkeley. Dept. of Civil Engineering. For primary bibliographic entry see Field 5B. W74-08662

WATER RESOURCES PLANNING-Field 6

Techniques Of Planning—Group 6A

DIFFICULTIES AHEAD FOR OREGON RE-GARDING ESTUARY REGULATIONS, CONTROL AND PROTECTION,

Oregon State Dept. of Environmental Quality, Portland

For primary bibliographic entry see Field 2L.

W74-08670

TECHNICAL AND ECONOMIC ISSUES IN THE WATER QUALITY MANAGEMENT OF YAQUINA BAY,
Oregon State Univ., Corvallis. Dept. of Agricul-

tural Economics

For primary bibliographic entry see Field 2L.

SANITARY-MICROBIOLOGICAL INVESTIGA-TIONS IN PREVENTING INFECTIONS OF BACTERIAL AND VIRAL ETIOLOGY, (IN RUS-

For primary bibliographic entry see Field 5C. W74-08692

WATER QUALITY AND WATER POLLUTION

CONTROL IN SWITZERLAND, Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).

O. Jaag.

Biol Conserv. Vol 4, No 5, p 345-354, 1972. Illus. Identifiers: Algae, *Eutrophication, Fish, Pollution, *Switzerland, Wastes, *Water quality, Water pollution control, Organic matter.

Originally, the organic matter is Swiss waters was automatically and entirely mineralized. However, the wastewaters of civilization overloaded this auto-purification mechanism, and the Disturbed biological and chemical balance imperilled Swiss watersupply, fish and bathing sites. The first mechanical-biological wastewater treatment plant in Switzerland was set up in the city of St. Gallen in 1916, but it was only in 1955 that an effective law ensured more drastic water pollution measures. Today approximately 1/2 the population and industries of Switzerland are connected to wastewater treatment plants. Although the organic pollutants are decomposed, i.e., mineralized in these plants, their basic compounds, such as phosphates, nitrates, etc., are involuntarily discharged into rivers and lakes, which thereby become over-fertilized. This eutrophication is manifested by a dense production of filamentous and planktonic algae as well as of aquatic higher plants. When, at the end of the vegetation period, this mass of organic matter dies, it causes a sedimentation on the bottom of a lake as a partly undigested sludge. Eutrophying substances may be eliminated by chemical precipitation (P) or biologi-cal O2 reduction (N) in sewage treatment plants. Due to run-off (erosion) from agricultural soils, many mineral substances still flow uncontrolled into lakes. The effectiveness of 3-stage sewage purification has, at least in some cases already been proved.--Copyright 1973, Biological Abstracts, Inc. W74-08697

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMIZATION OF THE ASSIMILATIVE WASTE CAPACITY OF THE UNSATURATED AND SATURATED ZONES OF AN UNCONFINED AQUIFER SYSTEM,

Univ., of California, Los Angeles. School of Engineering and Applied Science. For primary bibliographic entry see Field 5B. W74-08152

PROBABILISTIC MODELS IN THE DESIGN AND OPERATION OF A MULTI-PURPOSE RESERVOIR SYSTEM.

Univ., of California, Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.

SYSTEM OPTIMIZATION FOR PULP AND PAPER INDUSTRIAL WASTEWATER TREAT-MENT DESIGN.

Texas A and M Univ., College Station. Dept. of Industrial Engineering. For primary bibliographic entry see Field 5D.

SYSTEMS PLANNING DESIGN: CASE STUDIES IN MODELING, OPTIMIZATION, EVALUATION.

Massachusetts Inst. of Tech., Cambridge. Center

for Transportation Studies. R. de Neufville, and D. H. Marks.

W74-08153

Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1974. 446 p, 92 fig, 52 tab, 184 equ, 292 ref.

*Systems analysis, *Planning, ter resources, *Model studies, Descriptors: *Design, Water resources, *Evaluation, *Optimization, Economics, Transportation, Decision making, Simulation analysis, Multiple-purpose projects, Computer programs, Linear programming, Social aspects, Technology Identifiers: Multiobjective analysis, Production function, Cost function, Demand function, Nonlinear programming, Geometric programming, Chance-constrained programming.

Systems analysis techniques are applied to actual problems in planning and design; case studies which illustration the usefulness and relative strengths of alternative approaches to formulating and solving large-scale planning problems are presented. Included are econometric and nonexperimental modeling, large-scale mathematical programming and simulation, decision analysis, and multiobjective evaluation. Three major sections focus on: (1) modeling the system, including the use of production, cost, and demand functions; (2) searching for optimal ranges of design, where techniques include nonlinear programming, simulation, chance-constrained and geometric programming; and (3) evaluation and choice of alternatives, wherein multiobjective analyses are utilized. Nine out of the book's twenty-seven chapters deal with water resource problems, such as cofferdam optimization, inland water transport economics, river basin planning using optimization and simulation, examples relating to the analysis of water reuse alternatives in an integrated urbanagricultural area, determination of reservoir discharge policy, and the multiobjective design of Indiana's Big Walnut project. Also treated in detail are economics of electrical power generation, airport access services, railroad passenger transportation, solid waste collection models, cost effectiveness of freeway design alternatives, unreliability in railroad network operations, decisions concerning harbor fills and airport development, computer systems planning, and a normative model for decisions on technological projects hav-ing social consequences. (See also W74-08507 thru W74-08515) (Bell-Cornell) W74-08506

SYSTEMS ANALYSIS OF LARGE-SCALE PUBLIC FACILITIES: NEW YORK CITY'S WATER SUPPLY NETWORK AS A CASE

Massachusetts Inst. of Tech., Cambridge. Center for Transportation Studies. For primary bibliographic entry see Field 3D. W74-08507

ECONOMICS OF INLAND WATER TRANS-

Peat, Marwick, Mitchell and Co., Washington.

For primary bibliographic entry see Field 4A.

SUPPLY CURVE FOR THERMAL EFFICIEN.

Stanford Univ., Calif. Graduate School of Busi-

P. H. Cootner, and G. O. G. Lof.

P. H. Cootner, and G. O. J. Lot. In: Systems Planning and Design: Case Studies in Modeling. Optimization, and Evaluation (Ed. by R. de Neufville and D. H. Marks), Prentice Hall. Inc., Englewood Chiffs, New Jersey, p 80-97 (Chapter 7), 1974. 7 fig. 6 equ. 18 ref.

Descriptors: *Water resources development, Methodology, *Design, *Thermal powerplants, *Economic efficiency, *Cost analysis, Optimiza-tion, Electric power, Steam, Water demand, Cooling, Temperature, Pressure, Supply, Operating costs, Construction costs, Marginal costs, Water utilization. Thermal pollution, Equations. Planning, Management, Systems analysis, Mathematical models, *Forecasting. Identifiers: *Thermal efficiency, Production func-

tion, Supply schedule, *Supply curve, Isoquants, Sensitivity analysis, Gas turbine power. Atomic

A methodology is presented for predicting the potential nature of future water resource develop-ments. Based upon a detailed modeling of the production function for the generation of electric power, and of the prevailing and expected costs, a supply curve for thermal efficiency is developed. The supply curve indicates the costs of obtained higher thermal efficiency. Optimal designs are based upon consideration of models of the underlying technical processes (temperature and pressure) as represented by the production function, and of the economic cost functions (construction and operating costs). Both the production function and cost function are represented by isoquante. The two models are combined into supply functions: the technical (isoefficiency curves) and the cost (transformation curves) considerations are united, thus defining the most economically and technically optimal designs for various levels of technically opinial designs for various levers of thermal efficiency. Technically, the production of thermal efficiency exhibits diminishing returns to scale. The economic cost of achieving higher pres-sures and temperatures becomes more expensive. Results show both the technical and economic factors combine to increase the slope of the thermal efficiency supply curve at about 40%. To raise thermal efficiency appreciatively would be economically inefficient. Using sensitivity analysis, the possible results are examined of improve ments in the design of existing power plants, and of the introduction of new methods of production: gas turbines and atomic power. (See also W74-08506) (Bell-Cornell) W74-08509

ANALYSIS OF WATER REUSE ALTERNA-TIVES IN AN INTEGRATED URBAN AND AGRICULTURAL AREA,

Utah Water Research Lab., Logan. For primary bibliographic entry see Field 5D.

A COFFERDAM DESIGN OPTIMIZATION, Delaware Univ., Newark. Dept. of Civil Engineer-ing; and Bell Telephone Labs., Murray Hill, N.J. For primary bibliographic entry see Field 8A. W74-08511

THE COMBINED USE OF OPTIMIZATION AND SIMULATION MODELS IN RIVER BASIN

PLANNING.,
Massachusetts Inst. of Tech., Cambridge. Sloan
School of Management.

Field 6—WATER RESOURCES PLANNING

Group 6A-Techniques Of Planning

For primary bibliographic entry see Field 4A. W74-08512

DETERMINATION OF THE DISCHARGE POL-ICY FOR EXISTING RESERVOIR NETWORKS, Hydro-Quebec, Montreal. For primary bibliographic entry see Field 4A. W74-08513

MULTIOBJECTIVE ANALYSIS IN WATER RESOURCE PLANNING, Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Engineering. For primary bibliographic entry see Field 4A.

W74-08514

DIGITAL SIMULATION OF THE EFFECTS OF URBANIZATION ON RUNOFF IN THE UPPER SANTA ANA VALLEY, CALIFORNIA, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 4C.

W74-08598

TECHNICAL AND ECONOMIC ISSUES IN THE WATER QUALITY MANAGEMENT OF YAQUINA BAY,

Oregon State Univ., Corvallis. Dept. of Agricultural Economics.

For primary bibliographic entry see Field 2L. W74-08672

6B. Evaluation Process

THE USE OF QUESTIONNAIRES IN COLLECTING INFORMATION FOR URBAN FLOOD CONTROL PLANNING,

Georgia Inst. of Tech., Atlanta. Environmental Resources Center.

For primary bibliographic entry see Field 6F. W74-08151

ROAD LOG AND GUIDE--GEOLOGY AND HYDROLOGY FOR PLANNING, ANCHORAGE AREA.

Geological Survey, Anchorage, Alaska. For primary bibliographic entry see Field 4A. W74-08180

THE CITIZEN AND WATER MANAGEMENT: AN ATLAS OF WATER ATTITUDES IN SOUTHERN MINNESOTA.

Gustavus Adolphus Coll. St. Peter, Minn. Dept. of Geography. R. T. Moline.

Available from the National Technical Information Service as PB-232 504, \$3.75 in paper copy, \$1.45 in microfiche. Completion Report, April 1974. 68 p. 25 fig, 14 tab, 11 ref. OWRR B-042-Minn(1). 14-31-0001-3292.

Descriptors: *Attitudes, River basins *Planning, *Maps, Water resources, *Mangement, *Water pollution, *Social participation, *Minnesota, *Surveys.

Identifiers: Minnesota River basin.

A series of computer maps displaying the locational dimensions of attitudes toward water resources, water problems, and water planning in the Minnesota River Basin. Data were obtained from 1,184 responses to two mailed questionnaires sent to citizens throughout the Basin in 1971 and 1972. The questionnaires consisted of three parts, a short biographical introduction, a section wherein respondents were asked to rank their most important sources of water information and their most pressing water problem, and a section of 26 statements about water, water problems, and water planning patterned after Likert attitude measuring instruments. Results of this first phase of

the study indicate that there was more areal similarity in attitudes than had been thought. Water pollution was regarded as the first priority problem in 10 of the 13 sub-basins. Inadequate water resource planning, and wet agricultural fields were also thought to be serios problems over large sections of the Basin. There were significant spatial differences in attitudes but no strong clustering in any areas of the basin. Similarly, the maps showed little spatial pattern to responses from the Likert-type statements. Citizens expressed a need for and a belief in water resource planning. It is suggested that participation may be enhanced and simplified by using communication linkages already existing in the Basin such as local newspapers and television. (Walton-Minnesota) W74-08288

ESTIMATION OF OUTDOOR RECREATIONAL VALUES.

Florida Univ., Gainesville.

K. C. Gibbs, and J. F. McGuire, III. Available from the National Technical Information Service as PB-232 503, \$6.25 in paper copy, \$1.45 in microfiche. University of Florida Institute of Food and Agricultural Sciences, Economics Report 53, July 1973. 58 p, 3 fig, 5 tab, 26 ref, 2 append. OWRR B-007-FLA(11). 14-31-0001-3267.

Descriptors: *Water allocation(Policy), Water values, Water utilization, Water demand, Decision making.

The Kissimmee River Basin area, prior to extensive water management, was subject to wide fluctuations in water level. Floods and droughts occurred with some regularity depending on the amount of rainfall. Water management structures such as canals, dikes, and dams have been installed to provide a more stable water level throughout the basin. By removing the excessive fluctuations in the water level, the extremes of flood and drought have been tempered enough to allow a more constant use of the total area throughout the year. Water levels are maintained at specified stages depending on the usage, rainfall, and other factors. A study was designed to develop and test two types of water allocation models: linear programming and simulation. In order to allocate water efficiently values of alternative uses must be estimated. The value of water for agriculturally oriented industries bordering the Kissimmee River Basin was estimated by determining the amount of water drawn from surface water areas and increased value of the crops due to this water. The value of water for flood control purposes was estimated as the added value obtained by not having an area subjected to damaging fluctuations. The value of water for outdoor recreation was estimated. (Morgan-Florida)

DIFFICULTIES IN PLANNING WATER SUPPLY SCHEMES IN WEST MALAYSIA,

Malaysia Dept. of Water Supply, Kuala Lumpur.

Goh Kiam Seng.
In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 95-99, 1972.

Descriptors: *Planning, *Water resources development, *Urbanization, *Municipal water, *Industrial water, Hydrogeology, Water quality, Groundwater, Surface waters, Water pollution. Identifiers: *Malaysia.

The Government of Malaysia is spending large sums of money in extending existing water supplies and in developing new ones. There is a lack of long-range master planning for urban and industrial development. Problems encountered in water resources development are a result of rapid urbanization and changing patterns of industrializa-

tion. Lack of data and experienced staff make population estimation and estimation of reliable yield of water difficult. Problems also arise when there is conflict of interests of the beneficial uses of waterways among water resources development and industrial, mining and agricultural development. In recent years, attention has also been given to exploration for underground water Results have not been satisfactory because of lack of experience in geohydrological investigations and the complete absence of details on geological data. These problems coupled with limited financial resources and lack of experienced technical personnel hamper the implementation of the plan for water resources development. (See also W74-08454) (Knapp-USGS)

WATER RESOURCES DEVELOPMENT IN WEST MALAYSIA,

Drainage and Irrigation Dept., Kuala Lumpur, (Malaysia).
For primary bibliographic entry see Field 3B.

RATIONAL USE OF WATER,

W74-08463

Ministry of Public Works and Electrical Energy, Djakarta (Indonesia). Water Resources Develop-

W. S. Srimoerni Doelhomid.

W. S. Stimoerin Doctinional.

In: Water Resources, Environment and National Development-Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 128-139, 1972. 4 fig.

Descriptors: *Water utilization, *Planning, Water resources development, *Water storage, Water reuse.

Identifiers: *Indonesia.

In the densely populated islands of Java, Bali and Lombok water use is very intensive, not only for drinking and domestic purposes, but also for irrigation, industry and town water. Flood problems need to be solved. Indonesia has no problem of shortage of water resources, but has an unequal rainfall distribution over the year. The problem of Singapore is different; it has a real shortage of water resources. Even so, water is wasted; surface runoff is flowing unused into the sea. Estuarial storage in creeks along the coast has been proposed as the only way to store all available water, and could be a cheaper solution than recycling of very dirty town water or desalination of seawater. (See also W74-08454) (Knapp-USGS) W74-08466

RESEARCH ON THE CULTURE OF CERTAIN COMMON MARINE ORGANISMS IN SINGAPORE WATERS,

Singapore Univ. Fisheries Biology Unit. For primary bibliographic entry see Field 3F. W74-08477

A GUIDE TO NATURAL RESOURCE INFOR-MATION OF GEORGIA. Georgia Dept. of Natural Resources, Atlanta.

Georgia Dept. of Natural Resources, Atlanta. For primary bibliographic entry see Field 10C. W74-08487

THE METROPOLITAN TORONTO AND RE-GION WATERFRONT PLAN, 1972-1976. Metropolitan Toronto and Region Conservation

Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario). February 4, 1972. 58 p, 26 fig, 2 tab.

Descriptors: *Shore protection, *Water management(Applied), *Landfills, *Land development, *Recreation facilities, Regional development, Cost sharing, Public lands, Water conservation,

Water policy, Water resources development, Project planning, Ontario, Canada. Identifiers: Metropolitan Toronto.

A five year \$20,000,000 comprehensive plan for the development of the Lake Ontario waterfront area of Metropolitan Toronto is outlined. The cost of the project will be shared by the Province of Ontario and the municipalities in the Metropolitan Region. The city of Toronto will raise 93.5% of the revenues to come from the municipalities. The objective of the waterfront plan is to create a hand-some waterfront, balanced in its land use, which will complement adjacent areas taking cognizance of existing residential development and making accessible, wherever possible, features which war-rant public use. The project will encompass the area lying west of Dufferin Street and east of Coxarea lying west of Dufferin Street and east of Cox-well Avenue to the limits of jurisdiction of the authority. This one area has been divided into seven sectors: Etobicoke, Western Beaches, Eastern Beaches, Scarborough, Pickering-Ajax, Mississauga, and the Central Sector. These sectors are further subdivided into sites for individual projects. The proposed development will include the creation of public shoreland and island parks by oceanfront landfills, hydraulic improvements to reduce channel silting, refurbishing of present recreational facilities, and the construction of additional facilities, erosion control, and construction of a trail system for hiking. The Authority will acquire some public and quasi public lands in order to retain them for waterfront purposes. (LaPointe-North Carolina) W74-08489

RIVERFRONT DEVELOPMENT: THE POLITICS OF MASTER PLANNING, Illinois Univ., Urbana. Inst. of Government and Public Affairs. For primary bibliographic entry see Field 3D. W74-08495

POTENTIAL FOR MARGINAL COST PRICING IN WATER RESOURCE MANAGEMENT, Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering; and Johns Hopkins Univ., Baltimore, Md. Dept. of Political Economy. For primary bibliographic entry see Field 6C. W74-08496

WATER AND SEWER SUPPLY DECISIONS: A CASE STUDY OF THE WASHINGTON SUBUR-BAN SANITARY COMMISSION, Virginia Univ., Charlottesville. For primary bibliographic entry see Field 5G. W74.08407.

MULTIOBJECTIVE REDESIGN OF THE BIG WALNUT PROJECT, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.

For primary bibliographic entry see Field 4A. W74-08515

WATER POLLUTION: ECONOMIC ASPECTS AND RESEARCH NEEDS, Resources for the Future, Washington, D.C. For primary bibliographic entry see Field 5G. W74-08525

NATIONAL WATER COMMISSION REPORT, Hearings--Subcomm. on Water and Power Resources, Comm. on Interior and Insular Affairs, U.S. Senate, 93d Cong, 1st Sess, July 17, 1973. 431 p.

Descriptors: *Federal Government, *Water resources development, *Water demand, *Water policy, Water resources, Water conservation, Social aspects, Economic aspects, Water manage-

ment(Applied, Water supply, Water shortage, Water utilization, State Governments, Coordination, Water sourced, Administration, Water allocation(Policy), Political aspects, Water users, Electric power, Recreation, Project planning, Water requirements, Adoption of practices. Identifiers: *Congressional hearings.

The purpose of these hearings is to receive testimony from the National Water Commission concerning a five-year study of national water resources problems. Since the Commission's establishment, a national policy of preserving water resources in the form of wild and scenic rivers has been defined. Recreational demands upon water resources have greatly increased. The demands for water to support thermal-electric power generation have exceeded expectations. Greater varieties of water uses must be accomodated and larger populations must be served from a finite resource. Water resource planning must become more sophisticated and effective. Water development programs in the western United States profoundly effect all social development. State and local programs have been organized to supplement and complement federal programs. If major changes are made in federal programs, readjustments will be necessary not only in state and local water agencies, but perhaps in the entire outlook for social and economic development. (Sperling-Florida) W74-08527

THE NATIONAL SHORELINE STUDY, Corps of Engineers, Portland, Oreg. For primary bibliographic entry see Field 2L. W74-08671

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

OXYGENATION SYSTEM FOR AC-CELERATED SEWAGE TREATMENT, FMC Corp., Englewood, Colo. Div. of Environmental Equipment. For primary bibliographic entry see Field 5D. W74-08207

ALL COSTS MUST BE COUNTED..., Camp, Dresser and McKee, Boston, Mass. For primary bibliographic entry see Field 5D. W74-08211

COUNTERCURRENT WASHING TURNS THE TIDE AGAINST RISING EFFLUENT COSTS, Pierson and Co., Ltd., Manchester (England). For primary bibliographic entry see Field 5D. W74-08228

COST EFFECTIVENESS IN SEWAGE TREAT-MENT, Anglian Water Authority (England). Lincolnshire Sewage Div. For primary bibliographic entry see Field 5D. W74-08263

ECONOMIC OPTIMIZATION OF THE AVCO CRYSTALLIZATION PROCESS, AVCO Systems Div., Wilmington, Mass. For primary bibliographic entry see Field 3A.

AIMS OF WATER POLLUTION CONTROL, Binnie and Partners, London (England). For primary bibliographic entry see Field 5G. W74-08470

W74-08337

HONOLULU BOARD OF WATER SUPPLY ANNUAL REPORT FOR THE YEAR ENDED JUNE 30, 1973.

Board of Water Supply, Honolulu, Hawaii. For primary bibliographic entry see Field 5G. W74-08492

POTENTIAL FOR MARGINAL COST PRICING IN WATER RESOURCE MANAGEMENT, Johns Honkins Univ. Bultimore, Md. Dent. of

Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering; and Johns Hopkins Univ., Baltimore, Md. Dept. of Political Economy.

Johns Hopkins Chiv., Battimore, Md. Dept. of Political Economy. S. H. Hanke, and R. K. Davis. Water Resources Research, Vol 9, No 4, p 808-825, August, 1973, 79 ref.

Descriptors: *Water resources, *Water management(Applied), *Economic efficiency, *Marginal costs, *Pricing, Administrative costs, Equity, Investment, Municipal water, Municipal wastes, Industrial wastes, Flood protection, Flood plain insurance, Navigation, Recreation, Irrigation, Hydroelectric power, Wildlife habitats. Identifiers: Segment tolls.

An efficient pricing system to regulate demand and influence investment in water resources could be established for a variety of water uses. The tradeoffs to be recognized in establishing such a pricing system are economic efficiency, investment information, administrative and transaction costs, equity, and political realities. Following the policies of seasonal peak load rates, zonal rates, and frontfoot assessments, municipal water services lend themselves well to pricing policies. Imposition of prices on industrial and municipal sewage will establish a least cost adjustment to meet a given water quality standard. The introduction of segment tolls along navigable waterways is suggested to insure more equity and efficiency, and compulsory insurance programs in hurricane areas are advised to reduce flood damage in shoreline construction. Four other areas of water use, outdoor recreation, fish and wildlife habitats, irrigation, and hydroelectric power present difficult problems in establishing an efficient pricing policy. (LaPointe-North Carolina) W74-08496

6D. Water Demand

THE SEVIER COUNTY WATER PLAN,

Tennessee Dept. of Conservation. Nashville. Div. of Water Resources. J. W. Pinkerton. Water Resources Series No 12, 1973. 68 p. 18 fig, 7 tab. 31 ref.

Descriptors: *Water management(Applied). *Water allocation, *Water demand, *Water supply, Water resources, Water requirements, *Tennessee, Reservoir operation, Water resources development, Water utilization, Water distribution, Water control, Wells, Springs, Utilities, Surface waters.

face waters. Identifiers: Sevier County(Tennessee), *Water distribution systems, Water distribution policy, Utility districts.

Tennessee generally has adequate rainfall and vast amounts of impounded reservoir water, yet water shortage difficulties arise in localized areas. Sevier County, with a phenomenal recreational interest and related investment, has an immediate need for more water. The Sevier County Water Plan projects maximum water needs, quantitatively and qualitatively assesses the potential growth of the region, identifies troublesome situations or those which may develop. It can also serve as a general water resources guide for governmental agencies. Water in Sevier County is available from wells, springs, surface streams, and procurements from utility districts in adjacent counties. While wells and springs are less expensive to develop, their

Field 6-WATER RESOURCES PLANNING

Group 6D-Water Demand

natural variability makes yield assessment difficult to ascertain. Surface supplies are more predicta-ble, but usually require costly treatment. Methods for quantifying flow characteristics must be developed. Six utility districts provide a water distribution system for the county, while independent users, a large proportion of the population in outlying areas, still use wells and springs. Projected requirements of study sub-areas are compared with overall water availability so potential shortages can be identified; however, drought conditions are beyond the scope of the report. (Grden-North Carolina) W74-08493

SUPPLY CURVE FOR THERMAL EFFICIEN-

Stanford Univ., Calif. Graduate School of Business.

For primary bibliographic entry see Field 6A. W74-08509

NATIONAL WATER COMMISSION REPORT, For primary bibliographic entry see Field 6B. W74-08527

6E. Water Law and Institutions

THE CONNECTICUT TIDAL WETLANDS SUR-

Connecticut Univ., Storrs. Systematic and Evolutionary Biology Section.

M. W. Lefor.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21 p 1-19, December 1973.

Descriptors: *Wetlands. *Connecticut. *Legislation, *Surveys, *Tidal marshes, Environment, Regulation, Land management.
Identifiers: Wetland protection, Tidal wetlands.

Connecticut passed legislation in 1969 to protect and regulate the use of tidal wetlands, and new statutes for the preservation of inland wetlands are in effect. The Act clearly stated that an immediate mapping and inventory must be made of Connecticut's salt marshes. The Act lists those species of higher plants which form the dominant vegetation of salt marshes. Because the acreage of salt marsh to be dealt with was not large, it was decided to conduct the surveys on the ground, actually driving stakes according to the legal biological criteria. (See also W74-08157) (Knapp-USGS)

THE CONNECTICUT TIDAL WETLANDS SUR-

VEY, Connecticut Inland Wetlands Project. Middletown

D. S. McCluskey.

In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 20-29, December 1973. 2 ref.

Descriptors: *Wetlands, *Connecticut, *Legislation, *Surveys, *Soil classification, En-vironment, Regulation, Land management, Descriptors: vironment, Regu Marshes, Swamps.

The Inland Wetlands and Water Courses Act of Connecticut defines inland wetlands by soil classification rather than by vegetation. This direct contrast to the definition of tidal wetlands by plant species reflects the fact that a vegetative list is not definitive for the diverse freshwater wetlands where a series of variable plant associations may be encountered. Detailed soils maps are completed for over two-thirds of the state and general soils maps for the remainder, providing well established, easily identified criteria for delineating wetland boundaries. (See aslo W74-08157) (Knapp-USGS) W74-08159

INLAND WETLAND SOILS,

Connecticut Agricultural Experiment Station, New Haven.

For primary bibliographic entry see Field 2G. W74-08160

LEGAL ASPECTS OF WETLANDS PROTEC-TION--LIMITS OF THE POLICE POWER,

H. N. Johnson.

In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 135-136, December 1973.

Descriptors: *Wetlands, *Connecticut, *Water law, Legislation, Judicial decisions, Public rights, Water resources development, Swamps, Marshes, Tidal marshes, Land use.

The law relating to wetlands protection is a branch of what is referred to as the 'police power': it deals with the extent to which government may regulate people's conduct. In the instance of wetlands, it relates to the extent to which the state may regulate use of wetlands without being confiscatory. The issue that is going to have to be resolved by the courts is where the line should be drawn between the valid exercise of police power and taking of property. Test cases have been filed in various states, including Connecticut. Many rulings include strong language that wetlands must and should be protected under the police power. (See also W74-08157) (Knapp-USGS) W74-08167

INLAND WETLANDS FROM THE ADMINIS-TRATORS VIEWPOINT-BASED ON EX-PERIENCES WITH CONNECTICUT'S INLAND WETLANDS AND WATER COURSES ACT,

Connecticut Dept. of Environmental Protection.

S. Suffern

In: Proceedings of First Wetlands Conference. Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 137-138, December 1973.

Descriptors: *Wetlands, *Connecticut, *Water law, Legislation, Judicial decisions, Public rights, Water resources development, Swamps, Marshes, Tidal marshes, Land use.

Connecticut's law applies to both water courses and wetlands. Water courses are defined as rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs, and all other bodies of water, natural or artificial. Inland wetlands are defined as land, including submerged land, which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial, and flood plain by the National Cooperative Soils Survey. The problems encountered in administering the bill are practical ones. Foremost among these is the definition of edges. It is necessary to refine the techniques to the point where the wetland boundary can be defined to within a very few feet or less. A second problem is that of assessing the value of wetlands. A third problem is the effect of this type of legislation on people's attitudes toward land ownership. Many consider land use regulation an infringement on rights of owners of private property. It is obvious that total development of a given wetland will have serious environmental consequences. It is much more difficult to evaluate piecemeal uses. (See also W74-08157) (Knapp-USGS) W74-08168 THE SOIL CONSERVATION AND ITS ROLE IN WETLAND MANAGEMENT FOR CONNEC-TICUT.

Soil Conservation Service, Storrs, Conn

No 21, p 139-143, December 1973. 1 tab.

E. E. Offerman.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report

Descriptors: *Wetlands, *Connecticut, *Water law, *Soil surveys, Legislation, Judicial decisions, Public rights, Water resources development, Swamps, Marshes, Tidal marshes, Land use. Identifiers: *Soil conservation service.

Soil survey information is a basis for defining inland wetlands as outlined in Connecticut Public Act 155, the Inland Wetlands and Watercourses Act. Soils included in the definition are the poorly and very poorly drained, alluvial and the flood-plain soils. The mission of the U.S. Department of Agriculture Soil Conservation Service (SCS) is to assist in the conservation, development and productive use of the nation's soil, water and related resources. The technical assistance provided to individual land owners, groups, or units of government is based on a planning approach. This approach is to help land users or decision makers to plan each land unit as a whole, integrating all aspects of land use and treatment. (See also W74-08157) (Knapp-USGS) W74-08169

FEDERAL POLICY TOWARDS WETLANDS. Environmental Protection Agency, Edison, N.J. Federal Water Programs.

For primary bibliographic entry see Field 5G. W74-08170

INDUSTRIAL ASPECTS OF WETLAND USES,

Northeast Utilities Service Co., Hartford, Conn. Environmental Planning Coordination.

In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 146-147, December 1973.

Descriptors: *Wetlands, *Connecticut, *Water law, *Electric power industry, Electric power-plants, Legislation, Judicial decisions, Public rights, Water resources development, Swamps, Marshes, Tidal marshes, Land use

Reasons for past industrial development of lowlying and wet areas include: (1) the large level tracts available, often with few close neighbors; (2) relatively low-cost land, even after drainage and filling (and sometimes good building founda-tions because of impervious and underlying material causing the surface to remain wet); and (3) planning and zoning policies that encouraged industrial use by earmarking such areas for this use, or by failing to earmark enough other land for industrial use. Current public planning policies recognize wetland values previously underesti-mated and help to preserve wetland areas. A State land use policy should address needs for both preservation and development. Connecticut's inventory of acceptable sites is very low, and future sites will involve careful weighing of costs and benefits. Though some wetlands may be una-voidably used, other wetlands and natural areas a generating site. (See also W74-08157) (Knapp-USGS) may be preserved as a result of incorporation into

PANEL REVIEW AND COMMENTARY

R. Deitchman.

Connecticut Univ., Storrs. Inst. of Water

In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut

University Institute of Water Resources Report No 21, p 148-150, December 1973

Descriptors: *Wetlands, *Connecticut, *Water law, *Conferences, Legislation, Judicial decisions, Public rights, Water resources development, Swamps, Marshes, Tidal marshes, Land

A panel discussion was held to let a group of A panel discussion was held to let a group of knowledgeable persons with differing perspectives present their views on wetlands, particularly in Connecticut. The use of a soils definition of wet-lands seems to have several weak spots, including legal and technical boundary problems and the fact that the State of Connecticut will not be completely mapped until 1976. Education and public information must be part of any wetlands preservation and use program. Several states are now moving to consider a public trust doctrine for regulation of land use. Under the public trust, the state serves as a fiduciary for the citizens of the state and for the administration of land uses. Change in concepts of property ownership would be a long-term response in thinking of land as part of the larger ecosystem and that individuals have no inherent rights to land ownership. Since wetland land values appear to be a poor indicator of the worth of these resources to a poor indicator of the worth of these resources to society, industries and municipalities may be using, or abusing, these areas as an external dis-economy. (See also W74-08157) (Knapp-USGS) W74-08172

CLEANUP DOWN BY THE OLD MILL

For primary bibliographic entry see Field 5G. W74-08203

WATER RESOURCES: KEY TO WESTERN FU-TURE.

For primary bibliographic entry see Field 5G. W74-08204

OBJECTIVES OF IRRIGATION MANAGE-

MANAGEMENT COMMITTEE, Agricultural Research Service, Fort Collins, Colo. For primary bibliographic entry see Field 3F. W74-08264

INTERSTATE AND INTERNATIONAL.

AQUIFERS, Bittinger (M.W.) and Associates, Inc., Fort Col-lins, Colo.

M. W. Bittinger, and E. B. Jones. Water Resources Bulletin, Vol 8, No 2, p 386-390, April, 1972. 11 ref.

Descriptors: *Groundwater, *Aquifers, Interstate, International waters, Water law, Water utilization.

Many important groundwater aquifers cross state and national boundaries. The flow of water in these aquifers is not influenced by the boundaries but may be materially influenced by man's activi-ties on one or both sides of a boundary. Interstate and international problems may develop because and methational problems hay develop because of excessive groundwater lowering on one side of a boundary affecting water users on the opposite side of the line. Similarly, intensive groundwater development along a surface stream may influence the amount of surface water that flows across a the amount of surface water that Hows across a boundary. A third type of problem may develop when pumping on one side of the boundary in-duces poor quality water into an aquifer on the other side of the boundary. Several specific in-terstate and international aquifer problems are brieffuldargailed (Schools & Calendo State) briefly described. (Skogerboe-Colorado State)

ENVIRONMENTAL RESEARCH IN 1973--AN-NUAL REPORT.

National Environmental Research Center, Cincinnati, Ohio.

For primary bibliographic entry see Field 5G.

W74-08309

POLLUTION CONTROL OF DISCHARGE INTO RIVERS, LAKES AND COASTAL WATERS IN THE PHILIPPINES.

National Water and Air Pollution Control Com-mission, Manila (Philippines). For primary bibliographic entry see Field 5G. W74-08482

WATER POLLUTION IN THAILAND,

Applied Scientific Research Corp., of Thailand, Bangkok. Environmental and Ecological Research

For primary bibliographic entry see Field 5G. W74-08483

SUMMARY REPORT ON POLLUTION CON-TROL IN INDONESIA, Ministry of Public Works and Electrical Energy,

Djakarta (Indonesia). Planning and Urban Development.

For primary bibliographic entry see Field 5G. W74-08484

RIVERFRONT DEVELOPMENT: POLITICS OF MASTER PLANNING, Illinois Univ., Urbana. Inst. of Government and

Public Affairs For primary bibliographic entry see Field 3D. W74-08495

WATER AND SEWER SUPPLY DECISIONS: A CASE STUDY OF THE WASHINGTON SUBUR-BAN SANITARY COMMISSION,

Virginia Univ., Charlottesville. For primary bibliographic entry see Field 5G.

SUBMERGED AND SUBMERSIBLE LANDS OF

Advisory Committee to the State Land Board, Salem, Ore.

Available from Nat. Tech. Infor. Serv., Spring-field, Va. 22151, as PB-232 701, for \$8.75 paper copy; \$1.45 microfiche. October 1970. 118 p. OWRR C-2177 (3378) (1).

Descriptors: *Oregon, *Beds, *Ownership of beds, *Navigation, *Riparian rights, Accrebeds, "Navigation, "Riparian rights, Accre-tion(Legal aspects), Erosion, Avulsion, Navigable waters, Inland waterways, Estuaries, Streams, Streambeds, Rivers, Legal aspects, Legislation, Meanders, Banks, Pollution, Recreation, Tidal marshes, Tidal waters, Land management.

This compilation relates to a study assigned by the Oregon Legislature to the Advisory Committee to the State Land Board. It is a preliminary work designed to provide a legal base for defining proposing solutions to conflicting governmental jurisdictions, opposing claims of riparian ownership, overlapping authority of agen-cies, limits of navigation involving state ownership of beds and banks of Oregon's waterways and questions bearing on offshore authority and powers. The beds of navigable waterways and their banks, to the mean high water line, were granted to Oregon by the federal government at the time of statehood (1859). However, rivers, in their meandering routes to the sea have oscillated tremendously. Old banks and beds were abandoned, new ones created. These changes have occurred through the processes of accretion, erosion and avulsion, and the type of change involved often determines ownership of the river bed. Limits of navigability as they existed in 1859 also are confusing. The problems of tidelands, offshore submerged and submersible lands, and estuarine management are equally complex. This study is thus primarily pointed toward re-evaluation, clarification and revision of the above legal problems. (Ritchie-Florida)

W74-08516

ENVIRONMENTAL IMPACT STATEMENTS. Datatronic Systems Corp., Panorama City, Calif. For primary bibliographic entry see Field 6G.

THE IMPACT OF GROWTH ON THE EN-VIRONMENT.

For primary bibliographic entry see Field 6G. W74-08523

EFFLUENT CHARGES ON AIR AND WATER

Environmental Law Inst., Washington, D.C. For primary bibliographic entry see Field 5G. W74-08524

ADVERSE EFFECTS OF COAL MINING ON FEDERAL RESERVOIR PROJECTS.

For primary bibliographic entry see Field 5G. W74-08528

PROGRESS EVALUATION MEETING IN THE PROGRESS EVALUATION MEETING IN THE
MATTER OF POLLUTION OF THE INTERSTATE WATERS OF THE MISSOURI
RIVER, OMAHA, NEBRASKA AREA
(NEBRASKA-IOWA-MISSOURI-KANSAS).
Federal Water Pollution Control Administration, Washington, D.C For primary bibliographic entry see Field 5G. W74-08529

REPORT ON THE SECOND SESSION OF THE CONFERENCE IN THE MATTER OF POLLU-TION OF THE SOUTH PLATTE RIVER BASIN. Federal Water Pollution Control Administration. Washington, D.C.

For primary bibliographic entry see Field 5G. W74-08530

WHAT ARE POWERS OF LOCAL GOVERN-MENTAL AUTHORITIES UNDER FLORIDA LAW TO DISPOSE OF DERELICT AND ABAN-DONED VESSELS FOUND IN OR NEAR LOCAL

NAVIGABLE WATERS, Miami Univ., Fla. Ocean Law Program. Report No. 2, September, 1973. 6 p.

Descriptors: *Florida, *Legal aspects, *Navigable waters, *Coasts, *Local governments. Cities. Ships, Navigation, State governments, Federal government, Federal jurisidiction. Federal-state water rights conflicts, State jurisidiction. Identifiers: Navigation obstructions

A recent opinion by the Attorney General of Florida negates the theory that rivers and sub-merged lands are to be classified as 'public proper-ty,' as that term relates exclusively to land based facilities dedicated to public use. Likewise, the statutory definition of 'abandoned property' found in the same chapter of the Florida statutes cannot be interpreted to provide local governments with a legal vehicle to control derelict and abandoned vessels found in public waters. The Oil Spill Prevention and Pollution Control Act of 1970 grants authority to the State Department of Natu-ral Resources to remove any wrecked or aban-doned vessels from public waters. The exercise of such power by local authorities requires that the statute be amended. Such state dominion does not obscure the right of local governments to deal with derelict and abandoned vessels deposited in local waters. If derelict or abandoned vessels are deposited upland of the mean high water line, they may be validly classified as 'abandoned property,' but still not subject to disposal by county authorities unless they are on 'public property.' But if they are abandoned on private property, they are

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subject to disposal pursuant to the exercise of the county's police powers. (Ritchie-Florida) W74-08533

MUNICIPAL POWERS UNDER FLIRIDA LAW WITH RESPECT TO PROTECTION OF EN-VIRONMENTALLY ENDANGERED RIPARIAN LAND.

Miami Univ., Fla. Ocean Law Program.

D Cowan Report No. 1, September 1973. 4 p.

Descriptors: *Local governments, *Florida, *Coasts, *Construction, *Riparian rights, *Land fills, Legislation, Constitutional law, Cities, Aquifers, Environmental Effects, Groundwater, Water supply, Land use, Zoning, Planning, Legal aspects, Non-structural alternatives.

The legal authority of a muncipality to prevent the proposed development of three tracts of land which front on a short tidal stream in North Miami, Florida, is analyzed. Though the parcels are not interconnected, they comprise integral segments of an underground eco-system. For such lands to be converted to residential use would require extensive filling in of shoreline areas, resulting in irreversible ecological damage according to city officials. A court order was issued requiring the City of North Miami to grant a construction permit for one of the three tracts of land. and this paper analyzes the legal possibilities for preventing the development of the remaining two tracts. Florida law grants the Department of Pollution Control authority to supervise underground water, and arguably the filling of this property would have effect on the underground aquifer located beneath this property. In addition, Florida municipalities have been granted extensive home rule powers, both constitutionally and statutorily. More specifically, they have been vested with authority to deal with filling of low-lying vacant lands, pursuant to which they could adopt plans and specifications to govern the problem at hand. (Ritchie-Florida =) W74-08534

UTAH ENVIRONMENTAL PROBLEMS AND LEGISLATIVE RESPONSE: II, LEGISLATIVE RESPONSE.

Environmental Protection Agency, Denver, Colo.

For primary bibliographic entry see Field 5G. W74-08535

STATE OF WASHINGTON, 1973 ANNUAL RE-PORT, NATURAL RESOURCES AND RECREA-TION AGENCIES. 1973. 68 p, 33 chart.

Descriptors: *Water resources, *Publications, *Wildlife habitats, *Soil environment, *State governments, *Washington, Water resources development, Inter-agency cooperation, Docu-mentation, Hydrologic data, Administrative agencies, Environmental effects, Project planning, Water policy, Decision making, Coordination.

This report outlines the work of Washington's natural resources and recreation agencies during 1973 and their contribution to the task of maintain ing the state's environmental quality. The Agriculture Department's report outlines its program, needs, goals, and gives a summary of each division's activities. The Ecology Department's report sion is activities. The Ecology Department's reports is similar and some of its programs deal with litter and noise control, shoreline management and air and water quality. The Fisheries Department reported on their hatcheries, management and research, hydraulics, construction and patrol divisions are supposed for 1074. The General Programs of the sions, as well as an outlook for 1974. The Game Department reported on its reorganization and describes the non-game program aimed towards wildlife conservation. The Natural Resources Department outlines its management framework,

summarizes its activities and presents its various functions in graph form. The Oceanographic Commission outlines its strategy for meeting its newlyframed goals. The Committee for outdoor Recreaframed goals. The Committee for outdoor Recrea-tion summarizes its establishment, goals and planning functions. The Parks and Recreation Commission reports its development, programs and future outlook. Also included are short summaries from the Shorelines and Pollution Control Board and the newly-formed Thermal Power Plant Site Committee. (Sutton-Florida) W74-08536

LOUISIANA MOVES TOWARD COASTAL ZONE MANAGEMENT. Louisiana State Univ., Baton Rouge. Sea Grant

Legal Program Louisiana Coastal Law, Report No. 15, January 1974.6 p.

Descriptors: *Coasts, *Water resources development, *Water resources, *Project planning, *State governments, Louisiana, Research and develop-

ment, Local governments, Environment, Interagency cooperation, Water conservation, Land conservation, Project purposes, Administration, Water policy administrative agencies, Ecology.

This report provides an overview of Louisiana's coastal zone management activities--the present situation, the chronological development and likely future alternatives. The final decision regarding how the state's coastal zone program will be struc-tured and which agencies will be responsible for carrying it out will be left up to the legislature. After a chronological listing of all activities, the report compares the two major proposals before the Legislature. The two proposals are very similar, the major difference being the designation and make-up of the coordinating and policy-making group. Under the plan for the Louisiana Advisory Commission on Coastal and Marine Resources, there would be a clear distinction between planning, research and management, with all three supervised by a newly-created state agency. The program proposed by the Louisiana Coastal Com-mission eliminates the need for this new agency, thus not adding to the proliferation of agencies and resulting in savings to the state. The report sumresulting in savings to the state. The report animarizes all potential advantages and disadvantages of each program. While refraining from any opinion on which program is the best, the report points out the urgent need for responsible, affirmative legislative action on the subject. (Sutton-Florida) W74-08537

ATLANTIC STATES' CLAIM OFFSHORE OIL RIGHTS: UNITED STATES V. MAINE, W. F. Henri

Environmental Affairs, Vol 2, No 4, p 827-839, Spring 1973. 13 p. 62 ref.

Descriptors: *Judicial decisions, *Ownership of beds, *Submerged Lands Act, *Federal-state water rights conflicts, *Governmental interrela-Subsoil, Tidal waters, Continental shelf, Oceans, Atlantic Ocean, Cases, Water law, Coasts, Maine, State governments, Jurisidction, Water rights.

A critical question in the debate over the proper way to manage fuel resources is which level of government is best able to manage marine mineral resources. Central to this problem is the unsettled question of whether the federal government or the states have legal title to offshore areas. A case curbefore the United States Supreme Court should settle this question. The original thirteen colonies are claiming ownership of the Atlantic seabed and subsoil in excess of three miles from their coastline, based on grants from the British Crown. Federal control of offshore waters had been judicially established, but the Submerged Lands Act reversed that concept, declaring state

ownership of submerged lands to the three-mile limit. Although Maine asserts the Submerged Lands Act does not affect the present controversy, the author feels that the tests developed by the Court in interpreting the Act will be used to defeat Maine's claim. He also examines the histor-ical basis for the colonies' claim and concludes that it provides no sound basis on which to prevail. (Craig-Florida) W74-08538

ENVIRONMENTAL POLICIES AS A CONGRES-SIONAL REQUIREMENT FOR SOCIAL EF-

Committee on Public Works (US-Senate)

R. D. Grundy. Environmental Affairs, Vol 2, No 4, p 639-652, Spring 1973, 14 p.

Descriptors: *Legislation, *Federal Water Pollu-tion Control Act, *Industrial wastes, *Cost-benefit analysis, *Social values, Water quality, Social im-pact, Pollution(Water), Effluents, River basin development, Discharge water, Water pollution treatment, Pollution abatement, Impaired water quality, Water quality, Water quality standards, Federal government, Environmental effects.

The conflict between man's desire to improve his material standard of living through increased con-sumption of natural resources and his concurrent desire to preserve those resources has led to a new ethic of social efficacy as a condition of human use. Declining reserves of natural resources, increased demand, and environmental concerns have produced policies which will dramatically affect the country's economic and social institutions. The first signs of change were congressional action on air and water pollution, the National Environmental Policy Act (NEPA), and the creation of the Office of Technology Assessment. The Federal Water Pollution Control Act Amendments of 1972 (Act) are summarized and examined, with focus on the emphasis shift from river basin planning to effluent standards, and an examination of the goal of zero discharge. The Act's requirements of use, by 1983, of the best available technology by industrial sources to reach the goal of pollution free water by 1985 represent the balancing of social benefits and costs against economic benefits and costs. This Act, as well as the other congressional programs, reflects a new professionalism, and the criterion is social efficacy. (Craig-Florida) W74-08539

EASEMENTS: JUDICIAL AND LEGISLATIVE PROTECTION OF THE PUBLIC'S RIGHTS IN FLORIDA'S BEACHES, W. R. Bowdoin

University of Florida Law Review, vol XXV, no 3, p 586-596, Spring 1973. 11 p, 69 ref, 1 append.

Descriptors: *Florida, *Easements, *Public access, *Beaches, *Public rights, *Legislation, Scenic easements, Adverse possession, Public lands, Seashores, Recreation facilities, Littoral, Riparian land, Prescriptive rights, Riparian rights, Right-of-way, Legal aspects, Coasts.

Increasing public use of coastal beach property has increased the problem of private property owners in restricting the use of beaches. Courts in coastal states have used three common law doctrins to establish public easements in private beaches to protect the interests and rights of the public. Prescription, which must be used on a tract-by-tract basis, is too time consuming to be of value to the public. Implied dedication has the advantage of a 5-year, as opposed to prescription's 20-year, requirement. The doctrine can, however, be easily defeated by affirmative action by the landowner. Custom is put forward by the article as the best judicial remedy. It can be applied uniformly to all the state's beaches, avoiding piecemeal litigation. The author proposes a

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'Florida Open Beaches Act' to protect the Florida public's interests. The statute would avoid the constitutional prohibition against taking property without due process of law by redefining property rights as opposed to property ownership. Specifi-cally, the statute would provide that all beaches, line, are subject to an easement for use by all members of the public. (Craig-Florida)

NEW LAWS: CLEAN WATERS IN THE NEXT

Army War Coll., Carlisle Barracks, Pa For primary bibliographic entry see Field 5G.

BOUNDARY AND LAND DEVELOPMENT REGULATION RECOMMENDATIONS FOR THE BIG CYPRESS AREA OF CRITICAL STATE CONCERN.

Florida Bureau of Land Planning, Tallahassee. For primary bibliographic entry see Field 4A. W74-08543

FINAL REPORT ANALYZING COASTAL AND MARINE LAW TO DEVELOP AN AUTHORITY FOR COASTAL ZONE MANAGEMENT,

Texas Law Inst. of Coastal and Marine Resources, Houston.

March 19, 1973, 13 p.

Descriptors: *Water resources development, *Water resources, *Coasts, *Project purposes, *Water conservation, *Texas, Project planning, Legislation, Inter-agency cooperation, Water demand, State governments, Air pollution, Legal aspects, Regulation, Estuaries, Land management, Water management(Applied), Land use, Accretion, Erosion, Dredging, Zoning.

This report analyzes the work of the Texas Law Institute and its efforts toward implementing a via-ble coastal zone management program for Texas. Preliminary legal studies by students, summarizing federal and state regulation relating to the coastal zone, included such specific topics as water supply, drainage and pollution, and regulation of activities affecting bays and estuaries. Detailed legal studies were performed by law professors of problems caused by both lack of regulation and duplicative regulation of certain coastal zone uses. The final report outlines the inter-governmental work done by the Institute and the manner in which information concerning the studies was distributed to the public. In evaluating the Institutes' work, University involvement in furthering the goals and aspirations of state government was found to be beneficial to both since the state benefits from a reservoir of talent and knowledge not otherwise available. (Sutton-Florida) W74-08544

A MODEL WATER USE ACT FOR A RIPARIAN STATE--THE FLORIDA EXPERIENCE, Florida Univ., Gainesville. School of Law

F. E. Maloney. Contemporary Developments in Water Law, p 1-26, 1970, 26 p, 118 ref.

Descriptors: *Riparian rights, *Prior appropria-tion, *Florida, *Water resources, *Legislation, Streamflow, Beneficial use, Competing uses,

Water utilization, Water storage, Water shortage, Water policy, Water law, Legal aspects, Water management(Applied), Industrial water, Surgacegroundwater relationships, Regulated flow, Safe yield, Administration, Low flow, Riparian land. Identifiers: *Administrative regulations.

The reasonable use rule for water supplies allows each riparian a certain amount of flexibility in commencing a new use or expanding an existing

one. Assuming an ample supply of water, detailed statutory regulation should be unnecessary. The riparian system has been criticized because of its restriction on the use of stream water to riparian owners and its requirement that the water be used only on riparian land. There is also great uncertainty as to what constitutes a reasonable use of water for non-domestic purposes. The reasonableness of each use is determined by the needs of other riparians. Another criticism is the lack of administrative controls. The extent of a riparian's right of reasonable use can be determined only by litigation. As population growth and technological development have made greater demands on water supplies, the problem of maintaining stream flows and groundwater levels has become more impor-tant. The Florida 1957 Water Resources Law rejected a change to prior appropriation. The Com-mission that drafted the law found two problems: waste and unreasonable use. The 1957 law pro-vided machinery for the control of unreasonable overuse of available supplies, and authority to capture and divert excess water. (Sperling-Florida) W74-08545

PREFERENCE WATER STATUTES: THE TEXAS WAGSTAFF ACT. Utah Univ., Salt Lake City. Coll. of Law.

R. W. Swenson.
Contemporary Developments in Water Law, p 27-39, 1970. 13 p, 51 ref.

Descriptors: *Water supply, *Water shortage, *Water management(Applied), *Water demand, *Water rights, *Preferences(Water rights), Water distribution(Applied), Water policy, Water law, Water requirements, Water sources, Water utilization, Eminent domain, Condemnation, Competing uses, Domestic water, Planning, Irrigation practices. Water conservation. Water resources tices, Water conservation, Water resources development, Industrial water, Water reuse, Legal aspects, Legislation, Public rights, Water permits, Reservoir storage, Water allocation(Policy).

In the early part of this century, the greatest de-mands for water were made by farmers for irrigation. Private agencies were organized to serve the farmers' needs. However, in the last thirty years urban areas have begun to lead in the demand for water. Former federal reclamation projects for irrigation are now supplying urban areas. Private agencies and companies have been taken over by municipalities. The urban water supply problem is not new. In 1824 a reservoir in Westchester County supplied Manhattan. Networks of dams to drain rivers have also been employed to alleviate the problem. In some states municipalities have a constitutional or statutory preference over other water users which entitles them in times of scarci-ty to condemn prior water rights. If the preference is tied to the power of eminent domain, the city may condemn water outside its territorial limits. Another method of handling the planning problem is the conditional water decree. Any appropriator who can divert and apply the water to a beneficial use immediately may obtain a conditional decree from a court in connection with a general adjudication proceeding. The decree specifies the amount of water and purpose of the diversion. (Sperling-W74-08546

ENVIRONMENTAL LAW--WATER POLLU-TION-CONFLICT BETWEEN REFUSE ACT PERMIT PROGRAM AND NATIONAL EN-VIRONMENTAL POLICY ACT,

For primary bibliographic entry see Field 5G. W74-08550

A BILL TO PROVIDE FOR A NATIONAL PRO-GRAM OF DISASTER INSURANCE. Senate Bill 1578, 93rd Cong, 1st Sess (April 13, Descriptors: *Federal government, *Legislation, *Insurance, *Social aspects, *Administration, Coordination, Damages, Legal aspects, Risks, Economic impact, Regulation, Budgeting, Project planning, Cost-benefit analysis, Government finance, Decision making, Reclamation, Financing, Participating funds, Disasters, Flood plain insurance, Cost sharing, Operating costs, Management

Identifiers: *Administrative regulations.

A federal insurance program is created covering property loss and damage from disaster if in-surance is not made available to the public by the insurance industry. The act details the financial participation which will be sought by the Secretary of Housing and Urban Development (Secretary) of private insurance companies. The Secretary will provide by order the general terms and conditions of insurability which will be applicable to properties eligible for disaster insurance coverage. The Secretary will also prescribe applicable premium rates. The Secretary will coordinate the adminis-tration of this act with the authority conferred on him by the National Flood Insurance Act of 1968. The sum of eight-hundred million dollars can be borrowed from the tresury. Also authorized is the borrowed from the tresury. Also authorized is the creation in the tresury of a disaster insurance fund which will be available without fiscal limitation. The methods by which claims are adjusted and paid, for insured losses will be formulated by the Secretary. The dissemination of disaster insurance information, its coverage, objectives, and rates, will be accomplished by such action as the Secretary sees fit. (Sperling-Florida) W74-08552

A BILL TO PRESERVE AND PROMOTE THE RESOURCES OF THE CONNECTICUT RIVER VALLEY. Senate Bill No. 208, 93rd Cong, 1st Sess (January

4, 1973). 17 p.

Descriptors: *Massachusetts, *Connecticut River. *Federal government, *Rivers, *Conservation, *Scenic easements, Aesthetics, Recreation, Legal aspects, Land use, Project planning, Condemnaaspects, Lain use, Project planning, Condemna-tion, Eminent domain, Administration, Decision making, Water rights, Legislation, Water resources development, Water conservation, Water quality, Water quality control, Water supply, Water utilization, Scenery.

The Connecticut River in Massachusetts possesses unusual scenic, ecological, scientific, historic, recreational, and other values. In order to provide for the conservation of this resource, a Connecticut Historic Riverway has been established. The total acreage of land and water within the revised boundaries of the unit will not exceed 13,150 acres. The Secretary of the Interior (Secretary) is authorized to acquire the lands. waters, and interests in the area, including scenic easements, by donation, purchase, exchange or condemnation. The area will be maintained in as nearly its natural state and condition as possible without further development. No action will be taken which will result in a reduction of the quality or quantity of water available to existing public and private water supply systems. The area which comprises the Private Use and Development Zone is limited to non-commercial residential development. The Secretary will issue regulations following public hearings, specifying standards for the approval of zoning ordinances. The object of the standards will be to preserve the scenic quality of the zone. (Sperling-Florida) W74-08553

A BILL TO AMEND THE SOIL CONSERVA-TION AND DOMESTIC ALLOTMENT ACT. House Bill 153, 93d Cong, 1st Sess (1973). 6 p

Descriptors: *United States, *Legislation, *Contract administration, *Water quality control. *Farm management, Soil conservation, Land

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management, Regulation, Government finance, Wildlife conservation, Land use, Soil management, Recreation, Land resources, Adoption of ment, Recreation, Land resources, Adoption of practices, Agricultural engineering, Crop production, Water pollution sources, Erosion control, Water conservation, Alabama, Florida, Economic aspects, Legal aspects, Mississippi, North Carolina, South Carolina, Virginia, Project

Identifiers: Administrative regulations.

This is a bill to provide for a South Atlantic Basin environmental conservation program. The Secretary of the Interior is authorized to contract with landowners and operators to change cropping systems and land uses in order to control erosion. The program will also provide for soil and water conservation measures to control erosion, pollution, and sedimentation. Approved conserv plans developed in cooperation with the soil and water conservation district will form the basis for contracts. Contract administration is authorized contracts. Contract administration is authorized through 1986. The basin area includes Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Virginia. Plans of farming operations submitted to the Secretary may also include measures for enhancing fish and wildlife recreation resources, promotion of the economic use of land, and the reduction of agricultural pollution. In the contract, the owner will agree to effectuate the plan and any violation may be cause for termination. The Secretary can install monitoring devices to measure the progress of the program. (Sperling-Florida) W74-08554

POLLUTION PROHIBITED ZONES--REGULATIONS.

Federal Register, Vol 37, No 139, p 14302, July 19, 1972. 1 p.

Descriptors: *Oil, *Oily water, *Oil pollution, *Oil spills, Water pollution, Water pollution sources, Water pollution control. Pollution about the pollution control. Water pollution control, Pollution abatement, Regulation, International law, Treaties, Interna-tional waters, Legal aspects, Law of the sea, Coast Guard regulations, Oceans. Identifiers: Administrative regulations.

The purpose of this amendment is to add the sea areas within 100 miles of the coast of the Libyan Arab Republic to the list of oil pollution prohibited zones. The Libyan Arab Republic has deposited an Instrument of Acceptance of the 1954 Interna-tional Convention for the Prevention of Pollution of the Sea by Oil. This Instrument of Acceptance automatically makes the sea areas within 100 miles of the coast of the Libyan Arab Republic become part of the Mediterranean and Adriatic Prohibited Zone, as defined in the Convention. This amendment became effective on July 24, 1972. (Ritchie-W74-08555

VESSELS IN FOREIGN AND DOMESTIC TRADES--POLLUTION OF COASTAL AND NAVIGABLE WATERS.

Federal Register, Vol 37, No 158, p 16486, August 15, 1972. 1 p.

Descriptors: *Oil, *Oil pollution, *Oil spills, *Oily water, *Regulation, Water pollution, Water pollution sources, Water pollution control, Pollution abatement, Coast Guard regulation, Ships, Navigable waters, Coasts, Wastes, Waste disposal, Legal aspects, Water law Identifiers: *Coastal waters.

When any Customs officer has reason to believe that any refuse matter is being or has been deposited in navigable waters, or that oil is being or has been discharged into or upon the coastal navigable waters of the United States in violation of the Oil Pollution Act of 1924, he shall furnish to the district director a full report of the incident. He shall include when practicable, a sample of the

material discharged from the vessel in question. The district director shall forward this report to the District Engineer of the Department of the Army for his decision as to prosecution and a copy of each such report shall be furnished to the bureau. If the vessel involved is of American regis-try, a copy of the report shall be furnished to the District Commander of the Coast Guard district concerned. (Ritchie-Florida)

CONSERVATION OF MARINE LIFE--USE OF LIBERTY SHIPS BY STATES AS OFFSHORE ARTIFICIAL REEFS.

Federal Register, Vol 37, No 209, p 23120, October 28, 1972.

*Legislation, *Regulation, Descriptors: *Conservation, *Marine biology, *Marine animals, *Fish attractants, Ships, Environmental control, Reefs, Coasts, Oceans, Sea water, Coastal structures, Fish management, Fisheries, Federal government, Federal project policy, State governments, Inter-agency cooperation

The subject legislation authorizes the Secretary of Commerce to transfer Liberty ships (otherwise designated for scrapping) from the National Defense Reserve Fleet to states wishing to sink such ships for use as offshore artificial reefs for the conservation of marine life. Copies of any applications received by the Secretary of Commerce must be forwarded for comment to the Secretaries of Interior and Defense and to all other appropriate federal officers. Accordingly, all in-terested federal officers are invited to identify themselves as officers to whom applications should be sent for comment, and to identify the type of information which they wish to be elicited in the applications. All communications should be sent to the Chief, Division of Reserve Fleet, Maritime Administration, Department of Commerce. (Ritchie-Florida) W74-08557

POLLUTION PREVENTION VESSEL AND OIL TRANSFER FACILITIES.
Federal Register, Vol 37, No 246, p 28250-28261, December 21, 1972. 12 p.

Descriptors: *Water pollution control, *Regulation, *United States, *Oil wastes, *Water pollution sources, Oil wells, Oil industry, Drilling, *Water Adoption of practices, Specifications, Administration, Navigable waters, Ships, Environmental effects, Design standards, Construction, Engineeroffshore platforms, Equipment, Instrumentation, Economic aspects, Waste water treatment, Legal aspects, Aquatic microbiology, Standards, Waspollution effects, Data collections, Monitoring. Administrative regulations, tiguous zone, Hazardous substances(Pollution).

The U.S. Coast Guard, under authority of the Federal Water Pollution Control Act, has issued regulations governing the design, construction, and operation of vessels operating in the navigable waters and contiguous zone of the United States. Regulations have also been issued on the design and operation of onshore and offshore facilities engaged in the transfer of oil in bulk to and from vessels. The purpose of these regulations is to reduce the probability of an accidental discharge of oil or oily wastes. More significant and continuous environmental degradation results from regular and frequent discharges than one-time spectacular accidents. The probable beneficial environmental impact is not known with certainty, and a period of regulation will provide data. No expected adverse environmental effects are contem-plated. The goal of the regulations is to promote oil free water resources by removing the costs of environmental protection from the competitive arena and making them a fixed cost of operation. Studies show that oil can be harmful to marine organisms.

The regulations include provisions for facility inspections, operations manuals, equipment requirements, emergency equipment and vessel design. (Sperling-Florida) W74-08558

POLLUTION PREVENTION INSPECTION OF VESSELS AND DECK AND ENGINEER OF-

FICERS' LICENSES. Federal Register, Vol 37, No 246, p 28261-28263, December 21, 1972. 3 p.

Descriptors: *Regulation, *Federal government. *Oil pollution, *Barges, Legislation, Administra-tive agencies, Water law, Water pollution Control, Federal Water Pollution Control Act, Oil, Water pollution sources.

This amendment was adopted as a result of public comment on the regulation which first appeared in the Federal Register in 1971. The amendment promulgates new regulations that require merchant marine officers and seamen to have additional knowledge of oil pollution and of laws, regulations and procedures to prevent oil pollution. It also requires pollution prevention equip-ment for vessel certification and requires more frequent hull inspection (drydocking) of tank barges in fresh water service. The bulk of the amendment deals with clarification of the hull inspection requirements. Both the regulation and the amendment were made pursuant to the Water Pollution Control Act. (Flowers-Florida) W74-08559

STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION IN THE NATIONAL POLLUTANT DISCHARGE ELIMINATION

Federal Register, Vol 37, No 247, p 28390-28392, 28395-28399, December 22, 1972. 8 p.

Descriptors: *Regulation, *Federal government, *State governments, *Permits, Legislation, Administrative agencies, Water law, Effluents, Discharge(Water), Waste water(Pollution), Treatment, Water pollution treatment, Treatment facilities, Federal Water Pollution Control Act. Legal aspects, Water pollution, Water pollution control, Sewage treatment, Sewage disposal, Industrial wastes, Water quality.

State program requirements necessary for par-ticipation in the National Pollutant Discharge Elimination System are defined in this regulation. The Federal Water Pollution Control Act Amendments of 1972 give the Administrator of the Environmental Protection Agency the power to delegate permit authority to the states for the discharge of pollutants, provided such discharge meets standards set out in the Act. In order to gain such power a state must submit a full and complete permit program to the Administrator for his approval. A state must have the authority to issue permits not exceeding five years, must adequately notify the public and other interested groups, must abate violations of permits, and should insure that the state permitting agency receives adequate notice of new introduction or substantial changes in volume or character of pollutants introduced into publicly owned treatment works. The state must also insure that industrial users of publicly owned treatment works comply with pretreatment effluent standards, and must conform with certain monitoring and reporting requirements, enforce-ment provisions, and requirements for funding, personnel qualifications and manpower. (Flowers Florida) W74-08560

OIL POLLUTION PREVENTION--NON-TRANS-PORTATION-RELATED ONSHORE AND OFFSHORE FACILITIES--PROPOSED RULES. Federal Register, Vol 38, No 138, p 19334-19339, July 19, 1973. 6 p.

Descriptors: *Oil pollution, *Oil spills, *Water pollution sources, *Federal government, *Water pollution control, *Federal Water Pollution Control Act, Pollutants, Water quality, Oily water, Drill holes, Fuels, Industrial wastes, Oil, Oil industry, Oil reservoirs, Chemical wastes, Oil-water interfaces, Storage tanks, Drilling, Underground storage, Surface drainage, Administrative agencies, Offshore platforms, Shore protection, Coastal structures.

The Environmental Protection Agency (EPA), under the authority of the Federal Water Pollution Control Act (Act), conducted a regulatory review which established that most state oil spill prevention and control laws and regulations emphasize detection and clean up of spills once they have occurred but seldom specify spill prevention measures. Accordingly, the EPA proposed regulations pursuant to the Act which emphasize measures to pursuant to the Act which emphasize measures to prevent oil spills. The regulations apply to owners and operators of sizeable non-transportation re-lated onshore and offshore facilities engaged in drilling, producing, storing, processing, refining, transferring, or consuming oil, and provide for the preparation and implementation of Spill Prevention Control and Countermeasure Plans (SPCC Plans) for each facility. SPCC Plans shall be cer-tified by a Registered Professional Engineer and shall be prepared in accordance with guidelines set out in the proposed regulations. SPCC Plans are to be prepared within six months and are to be implemented within one year, but the Regional Administrator may grant an extension for the implementation of certain facets of the plan. Amendment of the plans is required if there is a change in the facility which affects the facility's potential for discharge of oil, or if a facility has discharged oil in harmful quantities into U.S. navigable waters. (Hunter-Florida) W74-08561

POLLUTION OF COASTAL AND NAVIGABLE WATERS (CFR TITLE 19, PART 4). Federal Register, Vol 38, No 10, p 1587, January

Descriptors: *Federal government, *Wastes, *Oil pollution, *Water Quality Act, Administrative agencies, Regulation, Coast Guard regulations, Rivers and Harbors Act, Water pollution, Oil, Legislation, Navigable waters, Water pollution control, Water quality, Water quality control. Identifiers: Coastal waters.

This regulation requires Customs officers who have reason to believe that refuse matter is being deposited into any navigable waters of the United States in violation of the Refuse Act of 1899, or that oil is being discharged or has been discharged into the navigable or coastal waters of the United States in violation of the Water Quality Improvement Act of 1970, to report such acts to the district director. In addition, the officer should supply the names of witnesses to the incident and, if possible, a sample of the material discharged into the water. The district director is, in turn, required to furnish this information to the district commander of the Coast Guard. (Flowers-Florida) W74-08562

INTERIM POLICY STATEMENT ON IMPLE-MENTATION, FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972. Federal Register, Vol 38, No 18, p 2679-2681, January 29, 1973. 3 p.

Descriptors: "Federal Water Pollution Control Act, "Legislation, "Nuclear wastes, "Water pollution sources, "Radioactive waste disposal, Radioactive wastes, Disposal, Waste disposal, Water pollution, Water law, Nuclear powerplants, Nuclear reactors, Legal aspects. Planning, Water quality, Water quality, Water quality, Water standards, Environmental control, Environmental effects. Identifiers: National Environmental Policy Act(NEPA).

The Federal Water Pollution Control Act Amendments of 1972 (FWPCA) modified federal agencies' responsibilities and authorities under the National Environmental Policy Act of 1969 (NEPA). The Atomic Energy Commission (AEC) issued an interim statement of policy, to be effective January 29, 1973, concerning the effect of section 511 of the FWPCA upon the Commission's regulatory responsibility and authority under NEPA in licensing actions. The statement's central premise is that the AEC's authority and responsibility under NEPA remain unaffected except to the extent there is a conflict with implementing actions taken under FWPCA. The Commission would continue to exercise its NEPA authority and responsibility in the interim period, so that there would be no hiatus in federal responsibility and authority respecting environmental matters embraced by both NEPA and FWPCA. The statement provides that to the extent requirements are imposed by FWPCA the Commission will not impose different requirements under NEPA. The Commission will not consider various alternatives which would constitute a review of similar alternatives under FWPCA or upset requirements where a particular alternative was adopted pursuant to FWPCA. (Craig-Florida) W74-08563

NATIONAL OIL AND HAZARDOUS SUB-STANCES POLLUTION CONTINGENCY PLAN. Federal Register, Vol 38, No 155, p 21888-21893, August 13, 1973. 6 p.

Descriptors: *Federal Water Pollution Control Act, *Oil pollution, *Oil spills, *Water pollution sources, *Administrative agencies. Federal government, Oil wastes, Oily water, Water pollution control, Water quality, Water pollution water ement, Water pollution abatement, Water pollution treatment, Waste dilution, Water Quality Act, Acration, Aquatic environment, Aquatic life, Waterfowl, Wildlife conservation, Fish conservation. Identifiers: Hazardous substances(Pollution).

Pursuant to the Federal Water Pollution Control Act Amendments of 1972, the Council on Environmental Quality submitted a Contingency Plan which has been included in the Code of Federal Regulations. The plan's purpose is to provide for efficient, coordinated, and effective actions to minimize damages from oil and hazardous substance discharge, including containment, disper-sal, and removal. The plan seeks to promote the harmonious discharge of various federal agencies' statutory duties through the recognition of authority for action by those agencies having the most appropriate capability to act in each specific situa tion. The plan lists the relevant responsibilities of the federal agencies and directs that regional plans assure recognition of these responsibilities. States are invited to furnish liason to the federal Regional Response Team (RRT) and to participate in RRT emergency deliberations. Five response phases are recognized: Phase I provides for discovery of discharge and notification of the Regional Response Center, RRC, in Phase II, the On-Scene Coordinator (OSC) is to determine the propriety of actions taken by the person responsible for the discharge and is to monitor the progress of these actions; if inadequate actions are taken, the OSC advises the RRC to initiate further government action; Phase III includes collateral measures; Phase IV is cleanup, mitigation, and disposal actions: Phase V involves federal removal cost recovery and recovery for damages done to government property. (Hunter-Florida) W74-08564

POLLUTION CONTROL--WHO PUTS THE DIRT IN THE DRINKING WATER.
Business Week, p 32H-32L, May 5, 1973. 5 p.

Descriptors: *Groundwater, *Water sources, *Water pollution, *Groundwater pollution, *Water pollution sources, Effluents, Farm wastes,

Agricultural chemicals, Chemical wastes, Pollutants, Saline water intrusion, Encroachment, Water pollution effects, Color, Odor, Taste, Liquid wastes, Water pollution control, Pollution abatement, Water pollution treatment. Federal government, Research priorities, Hardness, Impaired water quality, Industrial wastes, Mine wastes, Treatment facilities, Underground storage.

The federal government in 1972 via the Water Pollution Control Act required the Environmental Protection Agency (EPA) to prepare a program which would halt further ground water pollution. The EPA has since awarded an \$809,000 study contract to Tempo, General Electric Company's think tank, to devise a technique for monitoring the nation's groundwater supply. Since present methods of detecting groundwater pollution are expensive. Tempo will probably concentrate on 'source monitoring' techniques. One of the most serious sources which will soon be monitored is industrial injection wells: several states and the EPA have already clamped down on such wells, but roughly 300 are still operating. Industrial groundwater pollution is also caused by leakage and spills during production and storage of liquid products. The best possible solution is recycling waste water and using land fills for leftover solids. (Hunter-Florida)

MEMORANDUM OF UNDERSTANDING RE-GARDING IMPLEMENTATION OF CERTAIN COMPLEMENTARY RESPONSIBILITIES--NOTICE

Federal Register, Vol 38, No 18, p 2713, January 29, 1973.

Descriptors: *Federal Water Pollution Control Act, *Governmental interrelations, *Federal jurisdiction, *Nuclear wastes, *Water pollution. Legislation, Waste disposal, Waste treatment. Water quality, Water quality control, Pollutants, Disposal, Nuclear powerplants, Nuclear reactors, Radioactive waste disposal, Radioactive wastes, Nuclear energy, Regulation, Inter-agency cooperation, Water pollution sources, Water pollution control, Permits, Administrative agencies.

The Environmental Protection Agency (EPA) has authority under the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) over certain discharges into navigable waters of pollutants from nuclear facilities and other activities requiring a license or permit from the Atomic Energy Commission (AEC). The AEC has responsibilities and authority under the National Environmental Policy Act of 1969 (NEPA) to take action with respect to environmental impact of discharges of pollutants. This memorandum reflects an agreement between the EPA and the AEC with regard to their respective statutory authorities. The AEC will exercise its authority in accordance with the Interim Policy Statement, 10 CFR Part 50, which requires the AEC in licensing to accept decisions under certain sections of the FWPCA. The EPA agrees to expedite the issuance of effluent limitations and the processing of applications for permits under section 402 of the FWPCA for nuclear facilities. The EPA, in establishing effluent limitations, will consider not only water quality, but other factors such as cost, age of equipment and facilities, control techniques, process changes, non-water quality, environmental impact and energy requirements. (Craig-Florida) W74-08566

OIL POLLUTION ACT AMENDMENTS OF 1973--LEGISLATIVE HISTORY.

U.S. Code Congressional and Administrative News, p 3732-3738, 1973. 7 p.

Descriptors: *Pollution abatement, *Water pollution control, *Oil wastes, *Ships, *Oily water,

Field 6-WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

Water pollution sources, Law of the sea, International waters, Oil industry, Federal government, Impaired water quality, Water law, Administrative agencies, United Nations, International law, Oil pollution, Water pollution, Oil spills.

The 1969 amendment to the 1954 International Convention for the Prevention of Pollution of the Sea by Oil is stricter than the Convention in terms of prohibiting intentional discharges of oil and oily wastes by vessels. Discharges are prohibited anywhere unless certain conditions are met. These conditions relate to discharge rate, oily mixture dilution, total quantity of oil discharged, and distance from land. A tanker is prohibited from any discharge within 50 miles of land. Beyond that distance it may only discharge while proceeding enroute so long as the discharge of oil content does not exceed 60 liters per mile, and provided that the total quantity of oil discharged on a ballast voyage does not exceed 1/15000 of the total cargo-carrying capacity of the vessel. The amendment regulates tank arrangements and tank size in order to limit the quantity of oil which can escape into the sea as the result of collision or vessel casualty. Criminal and civil penalties are provided by the amend-ments for violation of the standards of oil discharge. (Kelly-Florida) W74-08567

NATIONAL SEA GRANT COLLEGE AND PRO-GRAM--EXTENSION.

U.S. Code Congressional and Administrative News, P.L. 93-51, 87 Stat. 129, p 1978-1982, March 28, 1973. 5 p.

Descriptors: "Water resources development, *Research and development, "Marine water, *Federal project policy, "Colleges, Research facilities, Training, Education, Sea water, Projects, Legislation, Federal budget, Foreign research, Marine geology, Marine animals, Marine biology, Marine plants, Oceans, Aquatic life, Research priorities, International waters, Foreign waters

H.R. 5452, which amends the National Sea Grant College and Program Act of 1966, as amended, was passed by the House and was referred by the Senate to the Committee on Labor and Public Welfare and the Committee on Commerce. The committees recommended that the bill pass with an amendment. The Senate report includes a history of the Act. The basic Act authorizes grants for three kinds of resource development programs. These include programs to educate marine specialists, programs of applied research in marine resource development, and marine advisory programs. Recipients of grants are required to provide at least one-third of the total cost of projects. The Department of Commerce is charged with administering the Act. The bill provides an authoriza-tion of \$30 million for 1974, \$40 million for 1975, and \$50 million for 1976. The bill also authorizes the Secretary of Commerce to reduce the matching requirement in certain cases. The recommended amendment to the bill authorizes up to \$200,000 for a study to be conducted through the National Sea Grant College system of effective means of co-operatively sharing the results of research with other nations. (Hunter-Florida) W74-08568

POLLUTION AND OBSTRUCTION

N.J. Stat. Ann., ch. 23:5-28 (Supp 1973).

Descriptors: *New Jersey, *Legislation, *Water pollution control, *Oil wastes, *Water pollution sources, Surface waters, Oil industry, Fresh water, Aquatic animals, Wildlife conservation, Water quality control, Tidal waters, Administravater quanty control, I nail waters, Administra-tion, Decision making, Regulation, Specifications, Pesticide toxicity, Public health, Safety, Chemical wastes, Waste water treatment, Sewage disposal, Waste disposal, Water conservation.

Identifiers: *Administrative regulations. Hazardous substances(Pollution)

No person shall place petroleum products, debris, hazardous, deleterious, destructive or poisonous substances anyplace where it can find its way into the state's fresh or tidal waters. The aim of this prohibition is to abate the pollution and obstruc-tion of waters. The use of chemicals for mosquito or pest control by the state or by any person on agricultural, horticultural, or with livestock is not prohibited if it is done in a manner approved by the State Department of Environmental Protection. This exception also applies to discharges from the facilities for the treatment or the disposal of sewage or other wastes which are likewise approved by the department. The department will formulate rules and regulations to govern such discharges. In the case of pollution of waters by any substance injurious to fish, birds or mammals, t is not necessary to show that the discharge caused any death. The penalty for the violation of this statute is three thousand dollars for each of-If the violation is of a continuing nature, each day during which it continues shall constitute an additional offense. The department is authorized to settle any claim for a penalty in an amount which would be equitable. (Sperling-W74-08569

JOINT FLOOD CONTROL COMMISSION.

N.J. Stat. Ann., ch. 40:14-16 to 40:14-24 (Supp 1973)

Descriptors: *New Jersey, *Legislation, *Flood protection, *Flood damage, *Administration, State governments, Federal government, Floods, State governments, Federal government, Floods, Local governments, Decision making, Budget, Regulation, Public health, Safety, Administrative agencies, Coordination, Cost sharing, Legal aspects, Project planning, Standards, Water resources development, Salaries, Land management, Land ownership, Adoption of practices, Water management(Applied). Identifiers: Administrative regulations.

A Joint Flood Control Commission is established. Such commissions will be composed of two or more municipalities which will work toward the prevention and alleviation of flooding and flood The statute prescribes the method of the establishment and gives examples of basic terms which will be necessary in the creation of the commission. The statute specifies the members, the method of appointment, their terms, and compensation. The commissions are authorized to accept and solicit funds from local, state, and federal governments. The commission is given all the power which is necessary and proper to do acts necessary to fulfill the purpose of the statute. The only qualification on this power, besides fund limitations, is that any work be done in a comprehensive manner, and where flood control work is undertaken, that it be done in accordance with applicable law in a manner approved by the State Department of Environmental Protection. Data will be collected, studied, and analyzed on flooding, past floods, and the causes of floods in the area. The acquisition of lands within the floodway and low-lying areas will be encouraged. (Sperling-Florida) W74-08570

WATER AND SEWERAGE DISPOSAL AGEN-

CIES, N. J. Stat Ann, ch 40:14B-49 (Supp 1973).

Descriptors: *New Jersey, *Legislation, *Water *Water pollution control, *Contracts, *Administrative agencies, Waste water disposal, Water quality, Water conservation, Water , Water management(Applied), Water allocation(Policy), Water pollution sources, Waste water treatment, Budgeting, Adoption of practices, State governments, Municipalities, Regulation, Standards, Water resources development, Public health. Administration. Decision making. Contracts, Contract administration, Administrative regulations

Any municipal authority or sewerage authority, in order to foster the relief of waters from pollution or threatened pollution, may enter into contracts which relate to the collection, treatment, and disposal of sewage originating in the municipality. Any municipal authority or sewerage authority is likewise empowered to sell and supply water for fostering the provision and distribution of an adequate supply of water within the territorial area of the governmental unit. Such authority also in-cludes the power to enter into contracts. Methods of payment to the municipality for such services by the governmental unit purchasing those services are specified. Every contract will only be entered into pursuant to a resolution adopted by the governing body of the municipality. The contract can be made with or without consideration, and for a specified or unlimited time. Where a municipality has created municipal utilities authority. powers granted to the authority by statute are exclusive, except insofar as a municipality is specifically empowered to cooperate with such authority. (Sperling-Florida) W74-08571

FLOOD HAZARD AREAS. N J Stat Ann, ch 58:16A-50 thru 58:16A-66 (Supp

Descriptors: *New Jersey, *Legislation, ies, *Flood protection, *Administrative agencies, *Flood protection, *Public health, Safety, Regulation, State governments, Adoption of practices, Decision making, Coordination, Flood damage, Flooding, Flood Plain zoning, Social aspects, Legal aspects, Specifications, Municipalities, Water quality control, Conservation, Land use, Land management, Water management(Applied), Land classification,

Identifiers: Administrative regulations

In the interest of public health and safety, the New Jersey Division of Water Resources is authorized to delineate and mark flood hazard areas, to adopt land use regulations for the floodway, and to disseminate information on floods and flood damage. It may also adopt and amend regulations concerning the use of land in designated floodways in order to preserve flood carrying capacity. Waiver of these regulations is available to alleviate hardship. The New Jersey Department of Environmental Protection will promulgate minimum standards for land use in flood fringe areas to minimize for land use in flood fringe areas to minimize threats to the public welfare. Within twelve months after the promulgation of standards by this department, the affected municipality must likewise develop rules and regulations. Before any rule or regulation is adopted, there must be notice and public hearings. Lands regulated by the Wetlands Act are not affected by this statute. A viola-tion of this act or any regulation will be subject to a penalty of \$2,500 for each offense. (Sperling-Florida) W74-08572

STATE V BISHOP (ACTION FOR PUBLIC NUISANCE AND TREPASS IN FILLING AREA BELOW HIGH WATER MARK OF BAY). 348 N.Y.S. 2d 990 (Sup Ct 1973).

*Tidal marshes, *Water rights, *Bays. Descriptors: procedure, Adjudication *Equitable apportionment, Remedies, Legislation, Judicial decisions, *New York, Legal aspects, Boundary disputes, Water law, Water pollution, Marshes, Wetlands, Navigable waters, Land fills.

The State of New York alleged that defendent, by filling his property above and below the high water mark, committed a trespass, in that the area below the high water mark was owned in trust by the

town of Southampton. The State also contended that through his activities of filling the land, the defendent maintained an intolerable public nuisance and caused pollution of state waters. The Court held that the defendent was not guilty of trespass, nor of creating and maintaining a public nuisance, and that he had not polluted state waters. The Court decided eight separate issues in reaching its decision, including the authority of a court to determine title in such a suit, the rights of the State in bringing the action, and whether the State had proved its numerous allegations. The Court concluded that legal considerations pertaining to 'land under water' do not apply to marsh lands. In holding that defendant's land was marsh land and not 'land under water', conveyances and allotments made defendant's title valid, as the state government is permitted to convey shore lands which are navigable only as a matter of law. (Sutton-Florida) W74-08573

MARINE FISHERIES.

Y Environmental Conservation Law, secs 13-0301 thru 13-0371 (1972).

Descriptors: *New York, *Legislation, *Commercial fishing, *Aquatic life, *Water pollution control, Crustaceans, Atlantic menhaden, Oysters, Commercial fish, Marine fish, Dams, Lobsters, Aquiculture, Regulation, State govern-ments, Adoption of practices, Administrative agencies, Administration, Permits, Legal aspects, Public health, Safety, Sewage, Effluents, Industrial wastes, Waste water disposal, Water quality control, Environmental sanitation.
Identifiers: *Administrative regulations, Coastal

New York may lease state owned lands under water for the cultivation of shellfish except when such lands are within five hundred feet of the high water mark. The granting of leases is conditioned on a written application and payment of fees. The statute imposes a one dollar tax per acre on all land held under leases. All shellfish lands will be periodically inspected to ascertain the sanitary condition. The statute delineates when a diggers permit is necessary for the commercial taking of shellfish. Permits are also required of shippers and growers. The statute also delineates rules dealing with specific shellfish such as clames, oysters, scallops, crabs, and lobsters. Licenses are also required for boats which capture fish for food or fertilizer. Methods of catching fish are regulated. The use of beam trawls and otter trawls are prohibited in certain waters. Sludge, acid, or refuse from oil works, sugar houses, sewage, or any other substance injurious to shellfish is prohibited from being discharged into the waters of the state. The purpose of this provision is to protect shellfish from any adverse effects on flavor, odor, color, or on the public health. (Sperling-Florida) W74-08574

MINING ACT OF 1971. N C Gen Stat, secs 74-46 thru 74-68 (1971).

Descriptors: *North Carolina, *Permits, *Mine wastes, *Mining engineering, *Land reclamation, Water reuse, Public health, Safety, Legislation, State governments, Administration, Water pollution sources, Mine drainage, Administrative agencies, Adoption of practices, Decision making, Environmental sanitation, Specifications, Economic aspects, Project planning, Cost allocation, Reclamation, Waste water treatments, Channelization, Bank erosion, Stream improvement. Identifiers: *Administrative regulations.

Proper reclamation of mined land is necessary to prevent undesireable land and water conditions. These conditions would be detrimental to the general health, safety, and property of the state's citizens. No mining will be allowed in the state unless there are reasonable provisions for the protection of the surrounding environment and for reclamation of the land affected by mining. Before any operator engages in mining, a permit must first be obtained from the Department of Conservation and Development. No permit will be effective until the operator has deposited an acceptable per-formance bond. With the application for a permit there must be included a proposed reclamation plan. The plan must include proposed practices to protect surface resources, specifications for restoration of the surface suitable for the proposed use of the land, and the proposed method of ac-complishment. Also in the plan must be the manner and type of revegetation, the method of prevention and elimination of hazardous condi-tions to animal or fish life, the method of compliance with water pollution laws, and the methods of disposal of mining refuse. Each plan will state the methods of restoration or establishment of stream channels and banks to minimize erosion. (Sperling-Florida) W74-08575

DRAINAGE-MISCELLANEOUS PROVISIONS; PENALTIES.

Ill Ann State, ch 42, secs 12-7, 12-8, 12-9, 12-10, 12-19 (Smith-Hurd Supp 1973).

Descriptors: *Drainage, *Illinois, *Legislations, *Penalties(Legal), *Drains, Levees, Drainage systems, Drainage area, Drainage districts, Pumping plants, Structures, Water pollution, Water pollution control, Wastes, Waste disposal, Obstruction to flow, Inspection, Inter-agency cooperation, Legal aspects, Local governments, State govern-

It is a misdemeanor to obstruct, injure or destroy any drain, levee, drainage structure or pumping plant. The dumping of trash, refuse or debris into an open drain shall be treated and considered as obstructing a drain. The pollution of the water of any drain of any drainage district shall be considered an injury to such drain. Anyone who wilfully cuts or breaches any private, mutual or dis-trict levee is guilty of a felony. In addition to the criminal penalties, anyone who wilfully or negligently obstructs, injures or destroys a drain, drainage structure, levee or pumping plant is liable for the cost of repairing or reconstructing the same and for any damage to lands, crops or other property. Anyone who wilfully prohibits the commissioners of a district from going upon lands for the purpose of examining the work of the district is guilty of a misdemeanor. Anyone who wilfully prohibits or delays the construction or repair of any drain through the land of others is guilty of a misdemeanor. Commissions of a district shall cooperate in the exchange of information pertaining to drainage with the commissioners of other districts and with local, state and federal agencies. (Ritchie-Florida) W74-08576

WATER POLLUTION CONTROL FACILITIES --

TAX EXEMPTION.
La Acts 1973, ch 69, sec 1, to be codified as. La
Rev State 47:1977.

Descriptors: *Pollution abatement, *Control systems, *Louisiana, *Assessments, *Legislation, Water pollution control, Automation, Instrumentation, Governments, Mechanical control, Taxes. Value, Evaluation, Property values.

Pollution control facilities are defined and the assessment value of such facilities is the actual net value that could be realized at a fair voluntary sale taking depreciation and condition into account. The Board of Commerce and Industry is authorized to adopt rules and regulations for ap-proval of such devices and the administration of section. (Whisler-Florida)

SINCLAIR OIL CO. V. DELACROIX CORP. (DETERMINATION OF MINERAL RIGHTS AL-LOCABLE TO WATER BOTTOMS. 285 So 2d 845-54 (La Ct App 1973).

*Water law, *Water Descriptors: *Adjudication procedure, *Regulation, *Ownership of beds, Legal aspects, Water resources, Water policy, Fish management, Legislation, Judicial decisions, Navigation, Water regulation, Competition, River, Mineralogy

This appeal rejects claims by the State of Louisiana to mineral production royalities allocable to certain water bottoms. The basic issue was whether the State had divested itself of title to the water bottoms in question. The State's theory was based on a two-fold proposition. Since the waters were navigable, they must remain in the public domain, and transferrance of title was not possible. Also, as oyster production was possible, certain Oyster Statutes of 1902 would prohibit a valid title transfer. The claimants insisted the statutes of limitations would bar questions concerning the transfer, and in any event the waters were, and had always been, non-navigable. From all the evidence presented, the Court found the waters to be non-navigable. Being bound by earlier state Supreme Court rulings, it was also held that the statute of limitations would bar the case since a valid chain of title was found. Had the water been found to be navigable, the title to the mineral rights could not have been conveyed. As a valid chain of title was found, the Court found it unnecessary to determine whether oyster cultivation was possible. (Sutton-Florida) W74-08578

AIR AND WATER POLLUTION CONTROL PERMIT BOARD.

Miss Code Ann, sec 49-17-29 (Supp 1973).

Descriptors: *Mississippi, *Legislation, *Water pollution control, *Permits, *Administrative agencies, Water pollution, Air pollution. State govern-ments, Water permits, Waste disposal, Irrigation. Identifiers: Nuisance(Legal aspects).

A permit board to review application for, issue, modify, revoke, or deny permits required by the Mississippi Air and Water Pollution Control Act is created. The composition of the board is described. It shall be unlawful to cause pollution of the air or water or to discharge waste to lower the quality of the air or water below standards established by the board and such action shall constitute a public nuisance. The statute further provides a procedure for those denied a permit and allows the permit board to promulgate rules and regulations necessary to carry out the act. (Whisler-Florida) W74-08579

OPERATION OF MINES.

Pa Stat Ann, secs 691.315 thru 691.316 (1970).

Descriptors: *Pennsylvania. *Administrative agencies. *Mine wastes, *Permits. Mining engineering. Water pollution sources. State governents. Legislation, Regulation, Mine drainage. Safety. Public health. Aesthetics. Legal aspects. Cost allocation, Adoption of practices, Land use. Economics, Land tenure, Local governments. Land subsidence, Natural resources, Mineral industry, Conservation, Penalties(Legal).
Identifiers: *Administrative r regulations. Nuisance(Legal aspects).

This statute prohibits any person or municipality for putting any mine discharge into the state's waters without authorization. This authorization is a permit from the Department of Environmental Protection. A permit is also needed to operate the mine. The prohibited discharge includes those discharges after mining operations have ceased. The statute makes a discharge, or the operation of

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a mine, without a permit or contrary to the conditions of a permit, a nuisance. Whenever there is an application for a permit, the municipality within which the operation will occur will be notified. A bond to assure compliance may be required of permit holders. In addition, no polluting discharge may occur after mining operations have ceased. Liability will continue until the department determines that there is no further risk of pollution discharge. Whenever the Sanitary Water Board finds that pollution is or may result from a condition on the land, it can order the landowner or occupier to correct it, or take corrective action itself. The costs of this correction may be assessed in the manner of a civil penalty. (Sperling-Florida) W74-08580

COASTAL ZONE MANAGEMENT ACT OF

1972. 33 U.S.C., secs 1101 thru 1124 (1970), as amended, Pub L No 92-583, secs 301 thru 315 (October 27,

*Land Descriptors: *Legislation, *Coasts. management, *Grants, Environmental effects, Federal government, Management, Beaches, Shores, Coastal plains, Coastal marshes, Seashores, Shore protection, Tides, Inter-agency cooperation, Estuaries, Projects.
Identifiers: *Coastal waters, *Coastal Zone
Management Act of 1972, Estuarine sanctuaries.

This Act establishes a national program for the management, beneficial use, protection, and development of the land and water resources of the Nation's coastal zones. Essentially it authorizes the Secretary of Commerce (Secretary) to make annual grants to any coastal state to develop a management program for the land and water resources of its coastal zone, as well as administrative grants for the part of the costs of administering the state's federally approved management program. Approval of such programs by the Secretary depends upon compliance with rules and secretary depends upon compilance win rules and regulations promulgated by the Secretary, coordination with local, area-wide and interstate plans and continuing coordination, public notice, approval by the governor, as well as conserving specific areas. The Secretary is also required to consult and cooperate with other federal agencies. Funding for the development of estuarine sanctua-ries is provided. (Whisler-Florida)

IN RE CHINESE MARITIME TRUST, LTD. (LIMITATION ON LIABILITY FOR SUNKEN

478 F.2d 1357-1362 (2d Cir. 1973). 6 p, 5 ref.

Descriptors: *Panama Canal, *Water pollution, *Oil pollution, *Oil spills, *Navigable waters, Regulations, Law of the sea, Judicial decisions, Federal jurisdiction.

Identifiers: Navigation obstructions.

Owner of a sunken vessel advised the Panama Canal Company that it had abandoned the vessel to its insurance underwriter who did not intend to undertake removal of the vessel. The Canal Company commenced removal efforts. The vessel owner, faced with large cargo claims and claims for wreck removal expenses, commenced a proceeding for limitation of the owner's liability to its interest in the vessel and her pending freight, pursuant to the Shipowner's Limited Liability Act. The Canal Company also claimed that expenditures to clean up oil pollution resulting from leakage from the sunken vessel gave rise to a claim under the Oil Pollution Act. The court held that confronted with a statutory and regulatory duty to remove vessel which had sunk in navigable waters, the owner could not contend that failure to remove and consequent expense of removal were without its privity or knowledge, which was a condition precedent to its invocation of statute limit-ing its liability. Accordingly, the claim against owner for expenses incurred in removal was not limitable, and the owner could properly be made subject of an in personam suit to recover such expenses. The claim under the Oil Pollution Act was found not properly before the court. (Sears-W74-08657

DEEP SEARED HARD MINERAL. RESOURCES ACT--A NEGATIVE VIEW, Louisiana State Univ., Baton Rouge.

H. G. Knight.

San Diego Law Review, Vol 10, No 3, p 446-466, May 1973. 35 ref, 1 append.

Descriptors: *Law of the Sea, *International law, "Mineral industry, "Marine geology, Administra-tion, Water resources, Organizations, Federal government, Political constraints, Mining en-gineering, United Nations, Jurisdiction, Competing uses, Oceans, Foreign countries

While the Deep Seabed Hard Mineral Resources Act is good, it should not be adopted at this time. The Act doesn't serve the resource management interests of the United States and adoption should be put off, at least, until after the Third United Nations Conference on the Law of the Sea. The postscript states that adoption was put off until after the Conference, in hopes of securing international agreements on the subject. Arguments against present enactment are threefold: (1) it is inconsistent with this nation's present oceans policy; (2) it will probably have an adverse effect on current negotiations; (3) it contravenes international expectations evidenced in the principles resolutions of the General Assembly. (Sutton-Florida) W74-08658

INLAND LAKES.

Fla. Laws, ch. 147, sec. 1-7 (1973).

Descriptors: *Lakes, *Erosion, *Water pollution control, *Legislation, *Florida, Law enforcement, Water law, Pollution abatement, Regulations, Legal aspects, Waste disposal.

This Florida statute relates to inland lakes of less than one hundred fifty (150) acres. The Act defines certain nuisances relating to water pollution and shore erosion and provides a procedure for land owners to petition the Board of County Commis-sioners to abate such water pollution and shore erosion. The Act also authorizes the boards to enact ordinances to abate such nuisances and provides for penalties. (Sutton-Florida) W74-08659

DIFFICULTIES AHEAD FOR OREGON RE-GARDING ESTUARY REGULATIONS, CONTROL AND PROTECTION,

Oregon State Dept. of Environmental Quality, Portland.

For primary bibliographic entry see Field 2L. W74-08670

6F. Nonstructural Alternatives

THE USE OF QUESTIONNAIRES IN COLLECT-ING INFORMATION FOR URBAN FLOOD CONTROL PLANNING,

Georgia Inst. of Tech., Atlanta. Environmental Resources Center.

.. D. James, D. D. Crawford, J. S. Everman, J. B. Hildreth, and J. L. Paul.

Available from the National Technical Informa-tion Service as PB-232 423; \$7.50 in paper copy, \$1.45 in microfiche. Report No ERC-0274, Februa-ry 1974, 313 p, 2 fig. 54 tab, 4 append. OWRR C-2064(3359)(2). 14-31-0001-3359.

Descriptors: *Non-structural alternatives, *Flood plain zoning, Flood plains, Building codes, Flood

*Floodproofing. insurance. systems, *Social aspects, Social values, Recreation, Taxes, *Regulation, Law enforcement, Forecasting, *Economic feasibility, Planning, Identifiers: *Non-structural design.

Flood damages are substantially reduced as in-dividuals evacuate, flood fight, act rapidly to repair damages, prepare in advance to make their flood fighting more effective, employ small scale noted in the structural measures, or modify buildings or layouts to reduce damageability. Individuals operating on their own, however, underemploy these measures. Local government must often in tervene to promote their greater use through such means as flood warnings, dissemination of hazard information, taxes on flood plain occupants. provision of expert advice on self protection, regu-lations governing flood plain land use and building practices, financial assistance for implementing individual measures, or purchase and conservation of open space. Different means have differing degrees of success, and a given means can be expected to be more successful in one community than in another. This is because communities vary in flood plain geometry, flood management poli-cies, and the characteristics of flood plain occupants. Information on the local situation is thus essential to a well-formulated nonstructural flood control program. A questionnaire for surveying flood plain occupants and a method for employing the resulting project-specific information in the formulation of a program of nonstructural flood control measures are developed. An approximate method based on information obtained from less expensive sources is presented for cases in which it is not possible to use questionnaires. W74-08151

THE METROPOLITAN TORONTO AND REGION WATERFRONT PLAN, 1972-1976. Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario). For primary bibliographic entry see Field 6B. W74-08489

FLOOD PLAIN INFORMATION; GRANTS CREEK - TOWN CREEK, CITY OF SALISBU-RY, NORTH CAROLINA.

Army Engineer District, Charleston. S.C. For primary bibliographic entry see Field 4A. W74-08490

FLOOD PLAIN INFORMATION; PETERS CREEK AND LICK RUN, ROANOKE, VIR-

For primary bibliographic entry see Field 4A. W74-08491

DEFINITION OF CRITICAL COASTAL AREAS

AND APPROACHES TO STANDARDS FOR MANAGEMENT, South Carolina Wildlife and Marine Resources Dept., Charleston. For primary bibliographic entry see Field 2L. W74-08532

A BILL TO PROVIDE FOR A NATIONAL PRO-GRAM OF DISASTER INSURANCE. For primary bibliographic entry see Field 6E. W74-08552

6G. Ecologic Impact Of Water Development

PROCEEDINGS: FIRST WETLANDS CONFERENCE, JUNE 20, 1973, Connecticut Univ., Storrs. Inst. of Water Resources. For primary bibliographic entry see Field 2L. W74-08157

THE ECOLOGICAL ROLE OF INLAND WET-LANDS.

Connecticut Coll., New London. Dept. of Botany. For primary bibliographic entry see Field 2L. W74-08164

INSECTS (CHRYSOPS FLIES) IN CONNECTICUT SALT MARSHES,

Connecticut Agricultural Experiment Station, New Haven. For primary bibliographic entry see Field 2L. W74-08166

A WORLDWIDE DIRECTORY OF STREAM ECOLOGISTS.

Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.

For primary hibliographic entry see Field 10C

For primary bibliographic entry see Field 10C. W74-08235

ENVIRONMENTAL INFORMATION SOURCES -- ENGINEERING AND INDUSTRIAL APPLICATIONS: A SELECTED ANNOTATED BIBLIOGRAPHY.

Massachusetts Inst. of Tech., Boston. James Madison Barker Engineering Library. For primary bibliographic entry see Field 10C. W74-08401

ENVIRONMENTAL IMPACT STATEMENTS. Datatronic Systems Corp., Panorama City, Calif. Available from Nat. Tech. Info. Serv., Springfield,

Available from Nat. Tech. Info. Serv., Springfield, Va. 22151, as PB-220 959, for \$3.00 paper copy; \$1.45 microfiche. January 1973. 6 p.

Descriptors: *Environmental effects, *Administrative agencies, *Planning, Environmental control, Federal government, Legislation, Governmental interrelations, Land use, Water pollution, Jurisdiction, Natural resources, Project feasibility, Regulation, Project planning. Identifiers: *Environmental impact statements.

An environmental impact statement (EIS) is required in advance of every major federal action, recommendation or report on legislation that may significantly affect the quality of the human environment. Each EIS must assess in detail the potential environmental impact of a proposed action, and all federal agencies are required to prepare statements for matters under their jurisdiction. Each EIS must contain any adverse environmental effects that cannot be avoided as well as alternatives to the proposed action that might avoid some or all of the adverse environmental effects. An EIS must be prepared and circulated for comment at least 90 days before the proposed action. (Whisler-Florida)

PORT EVERGLADES HARBOR, BROWARD COUNTY, FLORIDA (FINAL ENVIRONMENTAL STATEMENT).

Army Engineer District, Jacksonville, Fla. For primary bibliographic entry see Field 8A. W74-08518

SPUR CHANNEL TO ASTORIA WATER-FRONT, EAST RIVER, NEW YORK (FINAL EN-VIRONMENTAL STATEMENT).

Army Engineer District, New York. For primary bibliographic entry see Field 8A. W74-08519

OPERATION AND MAINTENANCE OF NEW BEDFORD HURRICANE BARRIER (FINAL ENVIRONMENTAL STATEMENT).

New England Div. Corps of Engineers, Waltham, Mass.

For primary bibliographic entry see Field 8D. W74-08520

LOWER RIO GRANDE FLOOD CONTROL PROJECT, TEXAS.

International Boundary and Water Commission, El Paso, Tex. For primary bibliographic entry see Field 8A. W74-08521

WATER RESOURCES COUNCIL REPORT ON THE PEARL RIVER COMPREHENSIVE BASIN STUDY MISSISSIPPI AND LOUISIANA. Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 4A.

W74-08522

THE IMPACT OF GROWTH ON THE EN-VIRONMENT.

Hearings-Subcomm on Air and Water Pollution, Comm on Public Works, U.S. Senate, 93rd Cong, 1st Sess, April 2, 3, 1973. 158 p, 8 fig. 4 tab, 203 ref.

Descriptors: *Environment, *Environmental effects, *Growth rates, *Population, *Planning, Legislation, Water pollution, Air pollution, Water pollution control, Pollution abatement, Community development, Social aspects, Legal aspects, Natural resources, Federal government. Federal project policy, Land use, Zoning, Land development, Land management, Non-structural alternatives.

The Senate Committee on Public Works, through its Subcommittee on Air and Water Pollution, has held hearings over the past decade which have illuminated harsh facts concerning man's abuse of the environment. These hearings have formed the basis for congressional enactment of laws to control air, water and land pollution and to protect critical natural resources. It is now apparent, however, that the pollution control laws form only one element of a nation growth policy. It is necessary to learn what kinds of growth and what rates of growth cause adverse environmental results, and to also learn how to predict the adverse impact of growth on the environment. It is also necessary to learn what kinds of growth are acceptable sub stitutes for other, more environmentally harmful kinds of growth. Legislation is required to regulate growth itself rather than the adverse by-products of growth in order to avoid drastic regulatory measures. These hearings received testimony from various witnesses regarding the problems of growth and its impact upon the environment. Ritchie-Florida) W74-08523

STATE OF WASHINGTON, 1973 ANNUAL RE-PORT, NATURAL RESOURCES AND RECREA-TION AGENCIES.

For primary bibliographic entry see Field 6E. W74-08536

ENVIRONMENTAL POLICIES AS A CONGRESSIONAL REQUIREMENT FOR SOCIAL EFFICACY,

Committee on Public Works (US-Senate). For primary bibliographic entry see Field 6E. W74-08539

ENVIRONMENTAL HAZARDS OF LARGE-SCALE DEVELOPMENTS,

Geological Survey, Raleigh, N.C. R. L. Nace.

Available from Dept of Geography University of Victoria, British Columbia, Canada. Price \$4.00 for book. In: Priorities in Water Management, Leversedge, F.M., editor: Proceedings of 22nd International Geographical Union Congress, August 1-8, 1972. Canada: Victoria University Dept of Geographical Series, Vol 8, p 3-18, 1974. 2 plate, 1 tab, 18 ref. p 3-18, 1974. 2 plate, 1 tab, 18 ref.

Descriptors: Water resources development, *Environmental effects, Earthquakes, Ecology, Reservoirs, Climates, Diversion, *Hazards, *Land use. ldentifiers: *Environmental hazards.

Most water-development projects have been conceived and implemented with little or no thought of ecological consequences. Changes in land use and changes in the patterns of water flow and use are among the more critical environmental modifications. When a single factor in the balance is disturbed or removed, it sets up a whole series of interactions. Entire populations of organisms may be eliminated or harmed. When several factors are disturbed, the effects often are so far reaching that they can hardly be evaluated after they occur, let alone be predicted. Our modifications of the environment have been so great that we no longer know where, or if, we fit in it. Loading of the earth's crust with dams and reservoirs causes earthquakes. Owing to the high specific heat of water and its high latent heat of vaporization, manipulations of water inevitably affect thermal regimes. The net effect of diversions would be to alter both the heat and vapor balances of large areas. Changed weather and climate in large areas would have repercussions in surrounding regions and probably in the whole northern hemisphere, if not the whole planet. (Knapp-USGS) W74-08601

COASTAL ECOSYSTEMS. ECOLOGICAL CON-SIDERATIONS FOR MANAGEMENT OF THE COASTAL ZONE,

Conservation Foundation. Washington, D.C. For primary bibliographic entry see Field 21.. W74-08642

FINAL ENVIRONMENTAL STATEMENT, WEST TERRE HAUTE LEVEE, WABASH RIVER, NDIANA, WABASH RIVER BASIN. Corps of Engineers. Louisville, Ky. For primary bibliographic entry see Field 8D. W74.0866.0

7. RESOURCES DATA

7A. Network Design

A PLAN FOR THE IMPROVEMENT OF THE LOW FLOW DATA NETWORK IN ALABAMA, Geological Survey, University, Ala.

E. C. Haves.

Water for Alabama Report Series. Alabama Development Office. May 1973. 27 p. 2 fig. 1 plate. 1 tab, 12 ref. Contract WRP-73-3.

Descriptors: *Low flow, *Network design. *Stream gages. *Data collections. *Alabama. Gaging stations. Streamflow forecasting. Hydrologic data. Instrumentation. Water measurement.

A systematic work plan was undertaken to improve the low-flow data network of Alabama. A key factor in the improved network will be the relation of low flows to the factors that control them. A major objective of the plan is the development of an improved technique for estimating the low-flow characteristics of ungaged streams. A comprehensive compilation and analysis of low-flow data for streams in Alabama will precede the design of the new network. This and related data developed in the design will support more precise and consistent estimates of low flows at ungage sites as well as updated and more comprehensive publications relating to the low flows of streams in the State. (Knapp-USGS)

Field 7—RESOURCES DATA

Group 7B-Data Acquition

7B. Data Acquition

IMPROVING THE ACCURACY OF POINT-GAUGE MEASUREMENT IN HIGH-VELOCITY FLOWS (AMELIORATION DE LA PRECISION DE LA POINTE DE MESURE DANS LES ECOU-LEMENTS RAPIDS).

Indian Inst. of Tech., Madras. Hydraulic Engineering Lab. R. Jayaraman, and V. Sethuraman.

Journal of Hydraulics Research, Vol 11, No 4, p 317-323, 1973. 2 fig. 1 ref.

Descriptors: *Instrumentation, *Measurement, Gauges, Flow, Water levels, Depth. Identifiers: *India, High velocity flow.

A new instrument was developed to improve the accuracy of point-gauge measurement in high-velocity flows. The Gauge Contact-Time Indicator can be used with any point gauge to improve the accuracy of depth measurement. The instrument indicates the percentage of time in which there is contact between the water level probe and the pulsating water surface. Since the instrument shows a 6 sec moving mean indication, the readings are fairly steady even in the presence of low-frequen-cy pulsations. The unit, which is self-contained portable, is built inside an aluminum chassis and is powered by four pen light cells. The instrument eliminates the personal error inherent in point guage measurement in high velocity flows. With this instrument, all observers can get readings within + or -0.01 cm. (Merritt-FIRL)

INSTRUMENTATION IN FULL SCALE SELF-AERATED FLOWS (APPAREILS DE MESURE DES CONCENTRATIONS ET DES VITESSES DANS UN COURANT MIXTE D'AIR ET D'EAU EN GRANDEUR NATURE),

Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik

For primary bibliographic entry see Field 8B.

THE POTENTIAL APPLICATION OF SATEL-

LITES IN RIVER REGULATION, Institute of Hydrology, Wallingford (England). For primary bibliographic entry see Field 4A. W74-08206

THE CALIBRATION AND USE OF A CONICAL HOT FILM ANEMOMETER PROBE IN RECIR-CULATING WATER FLOW, International Business Machines Corp., Charlotte,

For primary bibliographic entry see Field 2E. W74-08222

DIRECT MEASUREMENT OF WATER MOVE-MENT IN THE ZONE OF AERATION, California Univ., Davis. Coll. of Agricultural and

Environmental Sciences.
For primary bibliographic entry see Field 2G.

IRRIGATION NUMBER--A NEW TECHNIQUE TO EVALUATE IRRIGATION ADVANCE DISTANCE, Indian Inst. of Tech., Kharagpur. Dept. of Agricul-

tural Engineering.
For primary bibliographic entry see Field 3F.
W74-08266

AUTOMATED FLOW-RECORDING SYSTEM FOR FIELD DRAINAGE MONITORING-DIRECT DATA COMPILATION OF SURFACE

AND SUBSURFACE DRAIN FLOW Agricultural Research Service, South Burlington,

For primary bibliographic entry see Field 4A.

W74-08267

REFLECTANCE DISCRIMINATION OF COT-TON AND CORN AT FOUR GROWTH STAGES, Agricultural Research Service, Weslaco, Tex. For primary bibliographic entry see Field 3F. W74-08269

DETERMINATION OF WATER INTAKE RATE

OF ADVANCE, Pant Coll. of Technology Pantnagar (India). For primary bibliographic entry see Field 3F.

A NEW APPROACH TO SOIL TESTING: II. IONIC EQUILIBRIA INVOLVING H, K, CA, MG, MN, FE, CU, ZN, NA, P, AND S, Pennsylvania Agricultural Experiment Station, University Park. For primary bibliographic entry see Field 2G. W74-08281

SATELLITE VIEWS OF HURRICANE CAMILLE

National Aeronautics and Space Administration. Greenbelt, Md. Goddard Space Flight Center. For primary bibliographic entry see Field 2B. W74-08291

FLOOD MONITORING DAMAGE WITH SATELLITE IMAGERY, South Dakota State Univ., Brookings. Remote

For primary bibliographic entry see Field 4A. W74-08294

A DETAILED PROCEDURE FOR THE USE OF SMALL-SCALE PHOTOGRAPHY IN LAND USE CLASSIFICATION.

National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center. For primary bibliographic entry see Field 4A. W74-08299

SUSPENDED SOLIDS ANALYSIS USING ERTS-Pennsylvania Univ., Philadelphia. Moore School

of Electrical Engineering.
For primary bibliographic entry see Field 2J.
W74-08301

LIMNOLOGICAL STUDIES AND REMOTE SENSING OF THE UPPER TRUCKEE RIVER SEDIMENT PLUME IN LAKE TAHOE, CALIFORNIA-NEVADA,

California Univ., Davis. Inst. of Ecology. For primary bibliographic entry see Field 2J. W74-08302

A PROGRAMMED SAMPLER FOR RUNOFF AND BEDLOADS,

Agricultural Research Service, Lincoln, Neb. For primary bibliographic entry see Field 5A. W74-08361

A VESSEL FOR COLLECTING SUBSURFACE WATER SAMPLES FROM GEOTHERMAL DRILLHOLES,

Department of Scientific and Industrial Research.
Wairakei (New Zealand). Chemistry Div. For primary bibliographic entry see Field 4B. W74-08366

MEASUREMENT OF DYE CONCENTRATIONS BY PHOTOGRAPHY, California Univ., Berkeley. Dept. of Civil En-

gineering. For primary bibliographic entry see Field 2E.

W74-08376

A SIMPLY CONSTRUCTED AND ADJUSTABLE

MERCURY VAPOR CELL MOUNT, Geological Survey, Menlo Park, Calif J. W. Ball, and E. A. Jenne.

Bulletin of Environmental Contamination and Toxicology, Vol 7, No 6, p 369-370, 1972. 1 fig.

*Spectrophotometry, *Spectrophotometry, Equipment, Chemical analysis, Analytical techniques. Identifiers: *Mercury vapor cell.

Glass mercury-vapor cells are frequently used in Glass mercury-vapor cells are frequently used in an atomic-absorption spectrometer. A satisfactory and inexpensive self-contained holder for the mercury-vapor cell which protects the cell, but is readily adjustable and demountable from the burner holder and the mercury cell itself, can be made from polyethylene and flexible polyvinylchloride tubing. (Knapp-USGS) W74-08379 W74-08379

CLARKS FORK YELLOWSTONE RIVER REMOTE SENSING STUDY,
Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. For primary bibliographic entry see Field 2J. W74-08386

THE USE OF ERTS-1 FOR RELAYING HYDROLOGIC DATA IN THE DELAWARE RIVER BASIN.

Geological Survey, Harrisburg, Pa. R. W. Paulson.

Journal of the American Water Works Associa-tion, Vol 66, No 5, p 301-305, May 1974. 8 fig. 1 tab.

Descriptors: *Telemetry, *Remote sensing, *Satellites(Artificial), Data collections, Hydrolog-Descriptors: ic data, *Delaware River, Delaware River Basin Commission, Stream gages, Monitoring, Water resources. Identifiers: ERTS.

The Earth Resources Technology Satellite (ERTS-1) is the first satellite dedicated to testing systems of earth-resources-data acquisition. The satellite is being used by several hundred US and foreign investigators to test improved methods for remotely monitoring earth resources from space. Two of the systems, the Return Beam Vidicon (RBV) and the Multispectral Scanner (MSS), provide repetitive imagery, in several spectral bands, of the earth's surface. The Data Collection System (DCS) relays surface. The Data Collection System (DCS) relays telemetered data from ground-based radios, called Data Collection Platforms (DCP), to NASA ground-communication sites. Twenty DCP's are being installed and interfaced with water-resources stations in the Delaware River Basin. These stations, which include stream-gaging stations, groundwater observation wells, and waterquality monitors, are a subset of a larger number of field instruments operated by the USGS in the almost 13,000-squ mi basin. One of the prime objectives of the Delaware River basin data-relay experiment is to determine whether standard opera-tional USGS water-resources instrumentation can be interfaced successfully with the DCS and the data made to flow operationally to data users. (Knapp-USGS) W74-08583

7C. Evaluation, Processing and **Publication**

LOW-FLOW CHARACTERISTICS OF KENTU-

CY STREAMS, Geological Survey, Washington, D.C. R. V. Swisshelm, Jr. Open-File report, 1974, 1 sheet, 1 map. Descriptors: *Low-flow frequency, Low flow, *Kentucky, Hydrologic data, *Maps, *Data collections, Streamflow forecasting.

Low-flow data are given for streams throughout Kentucky. Where more than 10 years of record are , the 7-day annual low flows are used to define a frequency curve. The discharge at 10-year recurrence interval from that curve is the 7-day Q10. This report presents the 7-day Q10 discharge at 85 continuous-record stations and at 49 partialrecord stations. These values are shown on a map along with the station number and the drainage area. (Knapp-USGS) W74-08173

RAINFALL FREQUENCY ATLAS FOR MIS-

SOURI, National Weather Service, Columbia, Mo.

National Weather Service, Columbia, No. W. M. Wisner.

Available from NTIS, Springfield, Va. 22151, as COM-73-11760. Price \$3.00 printed copy; \$1.45 microfiche. Missouri University Atmospheric Science Department Extension Division Report 1973. 15 p, 7 fig, 5 ref, 2 append.

Descriptors: *Rainfall, *Missouri, *Frequency analysis, Meteorological data, *Maps, Statistics, Variability.

An analysis of precipitation records for Missouri provides information on how often extremely large amounts of rainfall can be expected. Estimates of the frequency of heavy rainfall were determined by using 50 years of daily precipitation data from 29 stations in or near Missouri. For each year, the greatest amount of precipitation in 1-, 2-, year, the greatst amount of precipitation in 1, 2-, 4-, 7- and 10-day periods was determined. Then, through statistical analysis, the values shown on the included maps were derived. The maps show the actual value computed for each station and the pattern for equal expected values. Seasonal varia-tions are also shown. Guides for estimating return periods or durations not presented on the maps are also given. (Knapp-USGS) W74-08174

A PLAN FOR THE IMPROVEMENT OF THE LOW FLOW DATA NETWORK IN ALABAMA, Geological Survey, University, Ala. For primary bibliographic entry see Field 7A.

SURVEY OF THE SEASONAL SNOW COVER

IN ALASKA, Alaska Univ., College. Geophysical Inst For primary bibliographic entry see Field 2C. W74-08179

ROAD LOG AND GUIDE--GEOLOGY AND HYDROLOGY FOR PLANNING, ANCHORAGE

Geological Survey, Anchorage, Alaska. For primary bibliographic entry see Field 4A. W74-08180

SURFACE-WATER AVAILABILITY, COLBERT COUNTY, ALABAMA. Geological Survey, Tuscaloosa, Ala.

For primary bibliographic entry see Field 4A. W74-08187

WATER AVAILABILITY, COOSA COUNTY, ALABAMA,

Geological Survey, Tuscaloosa, Ala For primary bibliographic entry see Field 4A. W74-08188

SURFACE-WATER AVAILABILITY, LIMESTONE COUNTY, ALABAMA, Geological Survey, Tuscaloosa, Ala. For primary bibliographic entry see Field 4A.

W74-08189

SURFACE-WATER AVAILABILITY, ETOWAH

COUNTY, ALABAMA, Geological Survey, Tuscaloosa, Ala. For primary bibliographic entry see Field 4A. W74-08190

AVERAGE WEEKLY RAINFALL AND PROBA-BILITIES DURING THE PLANTING-GROW ING-HARVESTING PERIOD IN SOUT CAROLINA,

National Oceanic and Atmospheric Administra-tion, Clemson, S.C. National Weather Service. For primary bibliographic entry see Field 2B. W74-08295

RECORDS OF WATER WELLS, SPRINGS, OIL-AND GAS-TEST HOLES, AND CHEMICAL ANALYSES OF WATER FOR THE MADISON LIMESTONE AND EQUIVALENT ROCKS IN THE POWDER RIVER BASIN AND ADJACENT AREAS, NORTHEASTERN WYOMING,

Geological Survey, Cheyenne, Wyo. For primary bibliographic entry see Field 4B. W74-08296

A DETAILED PROCEDURE FOR THE USE OF SMALL-SCALE PHOTOGRAPHY IN LAND USE CLASSIFICATION, National Aeronautics and Space Administration,

Houston, Tex. Lyndon B. Johnson Space Center. For primary bibliographic entry see Field 4A. W74-08299

SIMULATION OF WATER QUALITY IN TARAWERA RIVER,

Auckland Univ. (New Zealand). School of Engineering. For primary bibliographic entry see Field 5B. W74-08308

FLOODS IN PUNALUU-HAUULA AREA, OAHU, HAWAII.

Geological Survey, Washington, D.C. Octological Survey, Washington, DC 20242 - Price So.75. Hydrologic Investigations Atlas HA-473, 1973. I sheet, 5 fig. 1 map, 7 ref.

Descriptors: *Floods, *Hawaii, Beaches, Profiles, Clogging, Barriers, Coasts, Berms, Rainfall-runoff relationships.
Identifiers: Punaluu(Hawaii), Hauula(Hawaii),

Oahu(Hawaii).

The part of Punaluu-Hauula area, Oahu, Hawaii, that is subject to flooding lies behind a natural beach berm that runs parallel to the coastline. This berm is from 6 to 9 feet above mean sea level. Houses and Highway 83 are located on the berm where development is at a maximum. The area west of the berm is a lowland, altitude between 1 and 7 feet, where cane growth is predominant. Several streams and ditches drain the approximately 15 square-mile project area. The flow from this area discharges to the ocean through many bridges and culverts. Shifting sand and debris clog bridges and culverts. Shifting sand and debris clog these outlets frequently. The flood of February 4, 1965, was caused by a combination of moderately high runoff from the Koolau Range, heavy precipitation on the lowland area, and clogged outlets. Because the flood was caused by at least three factors, there is no single relation of flooding to peak stage or to total daily flow at the gaging catition. A castion of the draw howing fectors consistency. station. A section of the area showing factors con-tributing to flooding in the lowland is shown. In-formation may be used in evaluating effects of flooding on the economic development of lowlands of the Punaluu-Hauula area, in designing improvements to solve existing flood problems, and in formulating effective flood-plain regulations to minimize future flood damage. (Knapp-USGS) W74-08310

COMPUTER SIMULATION PRODUCTION - POTENTIAL AND HAZARDS, North Carolina State Univ., Raleigh. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F. W74-08331

GROUNDWATER LEVELS IN NEBRASKA,

Geological Survey, Lincoln, Nebr. For primary bibliographic entry see Field 4B. W74-08367

FOR WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO,

Geological Survey, Denver, Colo. For primary bibliographic entry see Field 4B. W74-08381

DIGITAL-MODEL STUDY OF GROUND-WATER HYDROLOGY, COLUMBIA BASIN IR-DIGITAL-MODEL RIGATION PROJECT AREA, WASHINGTON, Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 2F. W74-08382

FLOODS IN THE VICINITY OF CRETE, NEBRASKA,

Geological Survey, Washington, D.C. F. B. Shaffer, and K. J. Brown. Hydrologic Investigations Atlas HA-503, 1974. 1 sheet, 5 fig, 1 map, 1 photo.

Descriptors: *Floods, *Nebraska, Profiles, Flood recurrence interval, Flood frequency, Rivers, *Maps. Identifiers: *Crete(Neb), Rig Blue River(Neb)

The maximum known extent of flooding since the city of Crete, Nebraska, was established is shown on a map scaled 1:24,000. The boundaries of the inundated areas shown along the Big Blue River above the mouth of the West Fork are those for the 1967 flood, boundaries along both the West Fork and the Big Blue River from the mouth of the West Fork south to Crete are those for the 1950 flood, and boundaries along the Big Blue River south of Crete are those for both the 1950 and 1967 floods. The storms causing the two floods were not centered over the same part of the Big Blue River drainage basin; that for the 1950 flood centered over York, Neb., which is about 37 miles west-northwest of Crete and in the drainage basin of the West Fork, and that for the 1967 flood centered over Seward, which is on the Big Blue River about 21 miles upstream from Crete. Areas inundated by floods of record include considerable agricultural land along the West Fork and the Big Blue River, residential and commercial properties in the lower lying parts of Crete, and the Crete sewage disposal plant. The recurrence intervals of peak discharges (adjusted to present channel conditions) for the 1950, 1951, and 1967 floods at the Crete gaging station are about 15, 12, and 11 years. respectively. Graphs indicate the probability that a flood of specified peak discharge or peak stage will occur at Crete in this or any future year. The profile of the water surface of the highest flood of record and the profile of low flow of the West Fork and the Big Blue River are shown. (Brown-IPC) W74-08444

HYDROLOGICAL ACTIVITIES IN GAPORE,

Singapore Dept. of Public Works. Drainage and Marine Branch.

Field 7—RESOURCES DATA

Group 7C-Evaluation, Processing and Publication

In: Water Resources, Environment and National Development-a Volume II: Selected Papers, Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 44-60, 1972. 10 fig, 34 ref.

Descriptors: *Data collections, *Hydrologic data, Stream gages, Meteorological data, Streamflow, Rainfall, Water resources development. Identifiers: *Singapore.

Hydrological records available in Singapore are discussed. Proposed works which are either under implementation or at the planning state are also included. Publication and reports dealing with Singapore hydrology are listed. Three main departments, namely the Meteorological Service, the Water Department and the Public Works Department are involved in hydrological works. The longest continuous rainfall record is that collected at the MacRitchie Reservoir from 1878 to date. The longest streamflow record available is the monthly inflows into the MacRitchie Reservoir. (See also W74-08454) (Knapp-USGS)

THE USE OF ERTS-1 FOR RELAYING HYDROLOGIC DATA IN THE DELAWARE RIVER BASIN.

Geological Survey, Harrisburg, Pa. For primary bibliographic entry see Field 7B. W74-08583

FLOODS IN ALABAMA--MAGNITUDE AND FREQUENCY BASED ON DATA THROUGH SEPTEMBER 30, 1971,

Geological Survey, Tuscaloosa, Ala. For primary bibliographic entry see Field 2E. W74-08587

DIGITAL SIMULATION OF THE EFFECTS OF URBANIZATION ON RUNOFF IN THE UPPER SANTA ANA VALLEY, CALIFORNIA, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 4C. W74-0859

APPLICATION OF ERTS-I IMAGERY TO THE STUDY OF CARIBOU MOVEMENTS AND WINTER DISPERSAL IN RELATION TO PREVAILING SNOWCOVER,

Alaska Univ., College. For primary bibliographic entry see Field 2C. W74-08602

WATEQ, A COMPUTER PROGRAM FOR CAL-CULATING CHEMICAL EQUILIBRIA OF NATURAL WATERS,

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 2K. W74-08606

W74-08643

TRENDS AND VARIABILITY OF YEARLY MEAN SEA LEVEL 1893-1972, National Ocean Survey, Rockville, Md. For primary bibliographic entry see Field 2B.

VERTICAL DISTRIBUTION OF FALLOUT CESIUM-137 IN CULTIVATED SOILS, Agricultural Research Service, Oxford, Miss. Sedimentation Lab. For primary bibliographic entry see Field 5B. W74-08644

RADIOLOGICAL SURVEY OF NEW LONDON HARBOR, THAMES RIVER, CONN., AND EN-VIRONS, Office of Radiation Programs, Washington, D.C. For primary bibliographic entry see Field 5B. W74-08645

ENVIRONMENTAL RADIOACTIVITY IN IL-LINOIS, 1970,

Office of Radiation Programs, Washington, D.C. Field Operations Div. For primary bibliographic entry see Field 5B. W74-08646

STATE ENVIRONMENTAL RADIOACTIVITY SURVEILLANCE PROGRAMS, 1972, Office of Radiation Programs, Washington, D.C. For primary bibliographic entry see Field 5B. W74-08647

SUMMARY OF ENVIRONMENTAL MONITOR-ING AT PHILADELPHIA, 1958-1971, Philadelphia Public Health Dept., Pa. Div. of Occupational and Radiological Health. For primary bibliographic entry see Field 5B. W74-08648

TRITIUM BURDENS IN TWO ARCTIC VIL-LAGES, National Environmental Research Center, Las Vegas, Nev.

For primary bibliographic entry see Field 5B. W74-08649

TRITIUM SURVEILLANCE SYSTEM, OCTOBER-DECEMBER 1972.
Office of Radiation Programs Las Vegas Nev

Office of Radiation Programs, Las Vegas, Nev. For primary bibliographic entry see Field 5B. W74-08650

WATER SURVEILLANCE PROGRAMS, NOVEMBER 1972.
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 5B. W74-08651

WATER SURVEILLANCE PROGRAMS, FEBRUARY 1973 AND 1972, SPECIAL ANALYSES.

Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-08652

RADIOACTIVITY IN WASHINGTON SURFACE WATER JULY 1970-JUNE 1971. Washington State Dept. of Social and Health Ser-

vices, Olympia. For primary bibliographic entry see Field 5B. W74-08653

RADIOACTIVITY IN NEW YORK STATE SUR-FACE WATER, JULY-DECEMBER 1971. New York State Dept. of Environmental Conservation, Albany. Bureau of Radiological Pollution

Control. For primary bibliographic entry see Field 5B. W74-08654

WATER SURVEILLANCE PROGRAMS, APRIL-MAY 1973.

National Environmental Research Center, Las Vegas, Nev. For primary bibliographic entry see Field 5B. W74-08655

TRITIUM SURVEILLANCE SYSTEM, APRIL-JUNE 1973. National Environmental Research Center, Las

Vegas, Nev. For primary bibliographic entry see Field 5B. W74-08656

WATER ATLAS OF THE UNITED STATES, J. J. Geraghty, D. W. Miller, F. Van der Leeden,

Water Information Center, Port Washington, New York, 2nd enlarged edition, 1973, 122 plates.

Descriptors: "Water resources, "United States,
"Maps, "Data collections, Water types, Water
consumption, Engineering structures, Fish,
Meteorology, Precipitation(Atmospheric), Geographical regions, Geographical
hydrogeology, Hydrographs, Hydrology, Runoff,
Flow rates, Streamflow, Water properties.

The 122 maps of the USA, including Alaska and Hawaii, in this data compilation provide visual overviews with appropriate explanations of the nation's distribution of water resources, water types (ground, surface, saline, navigable, polluted, etc.), water usage (by agriculture, public supplies, industrial demand, etc.), water characteristics (such as dissolved solids contents, temperatures, hardness, mercury and other trace metal contents, etc.), aquatic biology (fish populations, fishkills, etc.), hydraulic engineering structures (dams, reservoirs, power plants, etc.), and related meteorological and physiographic information, such as annual precipitation, runoff, and river flows. (See also W69-09004) (Brown-IPC)

8. ENGINEERING WORKS

8A. Structures

METHODS VARY ON MWD PIPELINES. Western Construction, Vol 49, No 3, p 25-26, March, 1974. I fig. Identifiers: *Los Angeles(Calif).

Four contracts underway in Los Angeles County on the Metropolitan Water District's West Valley and Calabasas Feeders for installing water transmission pipe ranging in size from 54 to 103 inches in diameter are described. The contractor must follow a comprehensive set of safety procedures which are aimed at curbing the public hazards associated with open trench work. (Merritt-FIRL) W74-0819

GRANGEMOUTH TUNNEL SEWER,

K. Henry.

Tunnels and Tunnelling, Vol 6, No 1, p 25, 29, January-February, 1974. 4 fig.

Descriptors: *Tunnels, Sewers, Drainage systems, *Domestic wastes, Industrial wastes, *Storm water, Pumping, Construction. Identifiers: *Great Britain(Grangemouth).

The plans and construction of the Grangemouth tunnel sewer are described. The tunnel was constructed to form part of the Grangemouth Town Council's multimillion dollar project for the modernization and expansion of the drainage system of the town. Combined flows of domestic sewage, industrial effluent, and stormwater are conveyed by the tunnel 1.60 km across the town center to a pumping station on the south bank of the River Carron. Separate sets of raw sewage and stormwater screws lift the flow nearly 10 m to pass through mechanical screens. After screening, stormwater is discharged straight into the River Carron and raw sewage is pumped by centrifugal pumps a further 1.60 km downstream to the site of a sewage purification works shortly to be constructed. (Merritt-FIRL)

THE RIVER ITCHEN SCHEME OF THE PORT-

SMOUTH WATER COMPANY. Water and Water Engineering, Vol 77, No 934, p 481-485, December 1973. 1 fig.

Descriptors: *Treatment facilities, *Equipment, Descriptors. "Peatitien tactifies, Equipment, "Design criteria, Pumping plants, Sewers, Reservoir storage, Capital costs, Potable water, Water supply, Construction, Rivers.

Identifiers: "Great Britain(Portsmouth).

Details are given of the new River Itchen Abstraction Scheme inaugurated in October 1973 and designed to augment the potable water supplies by 10 mgd initially. The first stage works includes a river uptake, low lift pumping station, treatment works, high lift pumping station, 8.5 miles of 40inch main, and a 6 million gallon service reservoir. The second stage works includes 2.5 miles of 36-inch main, a 10 million gallon service reservoir, and further lengths of 20-inch and 36-inch connect-ing mains. (Sandoski-FIRL)

RECONSTRUCTING AN EGG-SHAPED SEWER.

Surveyor, Vol 43, No 4258, p 24-26, January 18, 1974. 8 fig.

*Sewers. Descriptors: *Water supply, Construction, Tunnel. Identifiers: *Great Britain(Bradford), Becks

The reconstruction of the Bowling Beck and the trunk sewer on Nelson St. in the City of Bradford is described. The major part of the city lies in a bowl with only a single outlet to the valley of the River Aire. This means that the sewers as well as the natural becks and watercourses all pass through the center of the city. The redevelopment of the central area has necessitated many diversions and reconstructions of the drainage system. The neck construction consisted of about 110 lin yd of 10 ft by 7 ft 6 in in situ RC culvert at the downstream end as an extension to the culvert constructed in 1963. Upstream of this culvert some 500 lin yd of segmental tunnel were driven south where a similar 10 ft by 7 ft RC culvert was con-structed, 80 lin yd in length, to pick up the west branch of the Bowling Beck. (Merritt-FIRL)

NEW ROLLER GATE IMPROVES THE RIVER

Public Works, Vol 105, No 4, p 90, April, 1974. 1 fig, 6 ref.

Descriptors: *Water control, *Hydraulic structures, Rivers, Flow control, Roller gates, *Flood control, *Texas.
Identifiers: *San Antonio(Tex.)

The new water control structure which replaced a dam at the downstream of the River Walk, a loop of the San Antonio River in downtown San Antonio, Tex., is described. It provides better flow control and increases the navigable length of the waterway. The two phase project involved the addition of a new water control gate between the bypass channel of the River Walk and the main channel of the San Antonio River, plus relocation of an existing tainter gate further downstream on the river proper. When water in the main channel of the San Antonio River reaches higher levels, the top section is lowered to prevent floodwaters from entering the River Walk loop. (Merritt-FIRL) W74-08250

SMALL TUNNELS, LARGE POTENTIALS,

Civil Engineering, p 34-35, March 1974. 3 fig.

Descriptors: *Tunneling, *Tunneling machines, *Automation. Identifiers: *Minitunnels, *Small diameter tunneling, Lasers, Pneumatic transportation.

A significant development coming recently from England has been the introduction of low cost, small diameter tunneling, particularly the minitun-nel, a strong contender for the existing open trench market. Such tunnels lend themselves to high speed mechanization, which may reflect lower costs by eliminating trench digging. Laser and automated tunneling will be fully exploited in the future. Pneumatic transportation of assorted materials is discussed. (Prague-FIRL) W74-08358

PINCH VALVES TAKE HOLD ON THE INDUS-

Red Valve Co., Inc., Carnegie, Pa. L. Schneider.

Water and Sewage Works, Vol 121, No 3, p 50, 51, 60, March 1974. 4 fig.

Descriptors: *Engineering structures, *Sewers, *Valves, Flow control, Design, Sewerage. Identifiers: *Pinch valves.

Pinch valves are being used with increasing frequency in sewer systems because of their design simplicity. Pinch valves cannot be jammed by debris, eliminate the need for periodic main-tenance or lubrication, and are available in a great variety of design--pneumatic pinch, mechanical pinch, combination valve, and of materials that in-clude many elastomers. Pinch valves often come with a service life of ten years or more. (Murphy-FIRL) W74-08363

DESIGN AND PERFORMANCE CRITERIA FOR SETTLING TANKS FOR THE REMOVAL OF PHYSICAL-CHEMICAL FLOCS,

Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering. For primary bibliographic entry see Field 5D. W74-08396

HOW SAFE ARE SEWERS FOR CONSTRUC-TION AND MAINTENANCE CREWS,

Howard, Needles, Tammen and Bergendoff, Inc., Indianapolis, Ind. For primary bibliographic entry see Field 5G. W74-08440

A COFFERDAM DESIGN OPTIMIZATION, Delaware Univ., Newark. Dept. of Civil Engineering; and Bell Telephone Labs., Murray Hill, N.J. F. Neghabat, and R. M. Stark.

In: Systems Planning and Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D.H. Marks), Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 190-201 (Chapter 14), 1974. 3 fig, 1 tab, 20 equ, 8 ref.

Descriptors: *Cofferdams, *Structural design, *Flood control, *Construction costs, Optimization, Height, Water pressure, Equations, Systems analysis, Mathematical models, Economics, Constraints, Water levels, Risks. Identifiers: "Geometric programming, *Nonlinear programming, Design values, Slippage, Interlock stress, Expected cost, Technological constraints.

Cofferdams function in a random environment characterized by fluctuations in surrounding water levels. Increasing the cofferdam's height diminishes chances of flooding but increases cost of construction. Design height, therefore, is an appropriate balance between the costs of construc-tion and of potential floods. Economic considerations are integrated into an expected cost objective subject to technological constraints. Geometric programming is used to derive design values of the eight, main and connecting cell diameters, and the cycle length in an example problem. The for-mulation pertains to circular cellular cofferdams (commonly used for deepwater and large projects) that rest on rock and have no inside berms. The expected cost objective function components are: costs of fill, steel sheet piles, and risk of flooding. Constraints, formulated here for slippage and in-terlock stress, must be satisfied to preclude failures. The cofferdam is important for research into the optimization of structural design: Its failure modes are distinct, its life is transient, and its failure rarely results in loss of life, and the appropriate structural analyses are tractable. The expected-cost objective function and associated constraints explicitly account for relevant economic and technological considerations and permit the extensive sensitivity analyses required. Geometric programming provides insights into the optimal al-location of resources among the component costs. location of resources among the component costs.
(See also W74-08506) (Bell-Cornell)

PORT EVERGLADES HARBOR, BROWARD COUNTY, FLORIDA (FINAL ENVIRONMEN-TAL STATEMENT).

Army Engineer District, Jacksonville, Fla. Available from Nat. Tech. Infor. Serv., Spring-field, Va. 22151, as EIS-FL-73-1408-F, for \$5.00 paper copy; \$1.45 microfiche. August 27, 1973. 56 p, 23 append.

Descriptors: *Harbors, *Dredging, *Channel im-Descriptors: "Pariors, Deuging, "Environmental effects, "Florida, Federal government, Excavation, Civil engineering, Backfill, Soil mechanics, Jetties, Navigation, Port authorities, Cost-benefit analysis, Turbidity, Construction, Structures. *Environmental impact statement, *Boward Co.(Fla.).

This final environmental impact statement deals with the improvement of a project harbor by deepening and modifying harbor dimensions in order to handle larger ships. The recommended improvement would provide for a channel depth of feet in the entrance channel and main turning basin plus an additional 3 feet for wave allowance in the ocean entrance, widening the 300-foot width section of the entrance channel to 450 feet, removing part of the north jetty, extending the main turn-ing basin to the southeast, widening Pier 7 channel to 400 feet with a 36-foot depth and maintenance of Berth 18 channel to a 36-foot depth. Some dredged material, if suitable, will be utilized for beach replenishment and some will be used to create an artificial reef. Unused material will be placed on diked upland areas. Adverse effects should be minimal with a temporary increase of water turbidity during construction and a higher pollution potential due to the increased traffic of larger vessels. The basic alternative is no action, but the use of offshore mooring facilities and varied design dimensions were considered during the planning process. (Sutton-Florida) W74-08518

SPUR CHANNEL TO ASTORIA WATER-FRONT, EAST RIVER, NEW YORK (FINAL EN-VIRONMENTAL STATEMENT).

Army Engineer District New York

Available from Nat. Tech. Info. Serv., Springfield, Va. 22151, as EIS-NY-73-1132-F, for \$4.75 paper copy; \$1.45 microfiche. January 3, 1973. 45 p, 4 tab, 12 append, I fig.

Descriptors: Water resources development. *Excavation, *Federal project policy, *Project purposes, *Economic feasibility, Project planning, whey York, Cost-benefit analysis, Environmental effects, Decision making, Land use, Methodology, Water resources, Dredging, soil mechanics, Navigable waters, Water pollution.

Identifiers: *Envornmental impact statement, *East River(N.Y.).

This final environmental impact statement is concerned with the improvement of navigation from the East River Channel, New York, to the Astoria waterfront. The proposed project will deepen the existing spur channel from 30 to 35 feet in earth

Field 8-ENGINEERING WORKS

Group 8A-Structures

and to 37 feet in rock at mean low water for a width of 400 feet. The project will also deepen the turning basin to the same depths. The excavated materials will be disposed of in an approved dumping ground. The project's feasibility is based on the increased economy of transporting residual and distillate fuel oils from other ports to the Astoria waterfront. Also, this excavation of approximately 850,000 cubic yards of bottom material should provide greater safety in navigation which will in turn further reduce discharges of pollutants into the water through accidents. Patterns of land use and pollution are not expected to change. Disturbance to fish from turbidity and possible gas liberation should be relatively minor. The adverse impacts on water quality should also be minor as well as temproary. Several alternatives were considered, including other transportation modes, maintaining the status quo and the construction of another unloading terminal in deeper waters of the river. (Sutton-Florida) W74-08519

LOWER RIO GRANDE FLOOD CONTROL PROJECT, TEXAS.

International Boundary and Water Commission,

El Paso, Tex. Available from the National Technical Informa-tion Service as ElS-TX-73-1730-F, \$5.75 in paper copy; \$1.45 in microfiche. October 4, 1973. 71 p, 1

Descriptors: *Internation law, *International waters, *Rio Grande River, *Texas, *Flood control, *Flood protection, *Mexico, Floodways, Flood routing, Flood damage, Project planning, Federal Government, Diversion structures, Dams, Federal Government, Diversion Structures, Dains, Flood plains, Levees, Watershed management, Turbidity, Land use, Water utilization.

Identifiers: *Environment impact statement, *Rio

Grande River(Tex.).

The proposed work is designed to reduce the flood damage potential in the area of the Lower Rio Grande Flood Control Project. The action will provide a greater degree of protection to United States lands and will assure diversion of the United States' one-half share of excess Rio Grande floodwaters, in accordance with an agreement with Mexico. The modifications consist of raising levees where necessary, removing flood-way restrictions, constructing a new Hackney Inlet to divert floodwaters upstream into a new section of what will be the United States Floodway, closing the Mission floodway and the con-struction of Retamal Dam. Increasing levee heights will require commitment of 112 acres of existing rights-of-way. The project will remove 111 acres from cultivation and change 42 acres of brushland to grassland. There will be minor temporary interference with transportation during con-struction, as well as a neglibible effect on fish from turbidity following rains. Various combinations of new and existing floodways were considered. However, this plan has the least environmental impact and is the most economical. (Sutton-Florida) W74-08521

OUTLET WORKS, WARM SPRINGS DAM, DRY CREEK, RUSSIAN RIVER BASIN, SONOMA COUNTY, CALIFORNIA, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.

J. H. Ables, Jr., and G. A. Pickering.

Army Engineer Waterways Experiment Station Technical Report H-73-3. February 1973. 41 p, 6 fig, 7 photo, 11 plate, 3 tab.

Descriptors: *Outlet works, *Hydraulic models, Open channel flow, Pipe flow, Tunnels, Critical flow, Unsteady flow, Non-uniform flow, Hydraulics, *California.

Tests were conducted on a 1:25-scale model of the outlet works for Warm Springs Dam California to

determine stilling basin performance and flow conditions in the outlet channel. Uncertainties existed as to the performance of the stilling basin, designed for full pipe flow, with the conduit flowing partially full since the curvature in the conduit could result in unequal distribution of flow at the outlet portal. The model reproduced the control structure, the entire length of the downstream conduit, the energy dissipator with fish channel, exit channel, and a portion of dry Creek. At partial conduit discharges, distribution of flow at the outlet portal was not sufficiently unbalanced by the curve in the conduit to affect stilling basin action. However, minor revisions were made to the stilling basins for more efficient energy dissipation. At intermediate discharges, moving pockets of air were entrapped in the downstream portion of the conduit. These pockets of air resulted in slug flow at the outlet portal, which created surges that carried through the primary and secondary basin into the exit channel. Changes were made in the design of the conduit to eliminate the slug flow conditions. The riprap requirements in the exit channel downstream from the energy dissipator were determined. (Knapp-USGS)

8B. Hydraulics

TURBULENCE CHARACTERISTICS IN SMOOTH OPEN CHANNEL OF CIRCULAR CROSS-SECTION (CARACTERISTIQUES DE LA TURBULENCE AU SEIN D'UN ECOULE-MENT A SURFACE LIBRE EN CONDUITE LISSE DE SECTION CIRCULAIRE,

Newcastle-upon-Tyne Univ. (England). C. Nalluri, and P. Novak. Journal of Hydraulics Research, Vol 11, No 4, p

343-368, 1973. 10 fig, 1 tab, 24 ref.

Descriptors: *Turbulence, *Open channel flow, *Depth, Flow, *Cross-sections, Numerical analysis, Investigations. Identifiers: *Great Britain, France.

Results of recent research dealing with determination of turbulence intensities and energy spectra in water flowing in a smooth open channel of circular cross section are presented. In varying the depth in a channel of circular cross-section a wide spec-trum of shapes and types of flows is encountered. variation is also clearly reproduced in the distribution of the turbulence intensities and the shape of the normalized plots. The value of the intensities reflect the variation in channel shape particularly at some distance from the wall and the free water surface. At bigger depths the crowning effect of the channel cross section causes an appreciable increase of turbulence levels towards the free surface. A detailed comparison of turbulence intensities with those recorded by other investigations in circular pipe flow or rectangular open channel flow shows some agreement for a varying range of depths depending on the type of malization and plots used and confirms that in a channel of circular cross section the flow changes from two to three dimensional as the depth in-creased. The measurements of the turbulence along 30 degree radial axis are comparable with those measured along the vertical axis. This applied also to a lesser degree to measurements along a displaced vertical. (Merrit-FIRL) W74-08192

INSTRUMENTATION IN FULL SCALE SELF-AERATED FLOWS (APPAREILS DE MESURE DES CONCENTRATIONS ET DES VITESSES DANS UN COURANT MIXTE D'AIR ET D'EAU EN GRANDEUR NATURE),

Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik. R. J. Keller.

Journal of Hydraulics Research, Vol 11, No 4, p 325-341, 1973. 8 fig, 1 ref.

Descriptors: *Open channel flow, *Velocity, *Air circulation, Flow measurement, Instrumentation, Analytical techniques. Identifiers: Germany

The development of field instruments which measure accurately air concentrations and velocities at points in the flow of open channels is described. The development included the design of a field unit by means of which depth profiles of air concentration and velocity could be obtained at vari-ous locations in the channel. After extensive use the instruments, it is concluded that the methods used to measure air concentration and stagnation pressure were satisfactory. Further-more, except near the flow surface, the errors as-sociated with the computer values of time average air concentration, stagnation pressure, and velocity were small. However, measured values of air concentration near the fluctuating surface and computed values of velocity very near the flow surface could not be relied on. (Merritt-FIRL)

THE FRICTION FACTORS OF OSCILLATING PIPE FLOWS.

Okayama Univ. (Japan). Dept. of Mechanical Engineering. K. Hirose, and M. Nobunaka

University, Vol 8, No 2, p 44-51, December, 1973. 10 fig, 3 ref.

*Investigations, *Pipe flow, umber, *Roughness(Hydraulic), Descriptors: *Reynolds number, *Roughness(Hydraulic).
*Turbulent flow, Steady flow, Mathematical stu-

The penduluation of a water column in a special vertical U-tube which was about a 2-meter long horizontal straight foot pipe is utilized as an oscillating pipe flow. Experimental results indicate that the momentary friction factors in the accelerating state are smaller and in the decelerating state are larger than that in steady state for each Reynolds number. (Sandoski-FIRL) W74-08259

PROBLEMS AND SCS SPECIFICATIONS FOR LOW HEAD PVC PIPELINES,

Soil Conservation Service, Bozeman, Mont.

Paper No 72-758 presented at Winter Meeting of the American Society of Agricultural Engineers, December 11-15, 1972, Chicago, Illinois. 23 p, 6 fig. 3 tab. 2 ref.

Descriptors: *Pipelines, *Plastic pipes, Plastic deformation, Hydraulic structures, Construction, Deformation, Failures, Specifications, Standards.

Survey conducted of low head PVC pipeline in-stallations and further evaluation of the systems that failed point out the importance of following every requirement specified in the design and installation of these systems. Properties of low head plastic pipe are discussed, and SCS Standards and Specifications for its use are (Skogerboe-Colorado State) W74-08278

UNIFORM IRRIGATION WITH LOW-PRES-SURE TRICKLE SYSTEMS,

Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. For primary bibliographic entry see Field 3F.

THE DEVELOPMENT OF MEANDERS IN NATURAL RIVER-CHANNELS,

Simon Fraser Univ., Burnaby (British Columbia). Dept. of Geography. For primary bibliographic entry see Field 2E. W74-08357

ENGINEERING WORKS—Field 8 Hydraulics - Group 8B

DISCHARGE AND TRAVEL TIME FOR GROUND-WATER CONDUITS,

GROUND-WATER CONDUITS, University of Southern California, Los Angeles. Dept. of Civil Engineering. S. S. Butler, and D. L. Gundlach. Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 100, No IRI, Paper 10393, p 17-29, March 1974. 11 fig, 1 tab, 4 ref, append.

*Groundwater Descriptors: movement Poscharge(Water), *Travel time, Mathematical models, Aquifers, Water yield, Permeability, Porous media, Irrigation water, Percolation, Conduits

system of mathematical and graphical procedures gives solution for the steady-flow discharge and travel time for nonuniform confined groundwater conduits in which any or all of the following characteristics vary from point to point: permeability, porosity, and cross-sectional area. The methods use solutions of mathematical models based on the Darcy equation and the equation of continuity. Modified procedures give relations with some loss in accuracy. oundwater conduits in which any or all of the tively simple solutions with some loss in accuracy. (Knapp-USGS) W74-08383

HYDRODYNAMICS OF SURFACE IRRIGA-TION-ADVANCE PHASE,
California Univ., Davis. Dept. of Water Science

and Civil Engineering.
J. G. Sakkas, and T. Strelkoff.
Journal of the Irrigation and Drainage Division,
American Society of Civil Engineers, Vol 100, No
IR1, Paper 10422, p 31-48, March 1974. 8 fig. 19
ref, append. UC Water Resources Project W-259.

Descriptors: *Seepage, *Open channel flow, *Furrow irrigation, *Surface irrigation, Numerical analysis, Infiltration, Hydrodynamics.

The Saint-Venant equations governing gradually varied, unsteady flow in an open channel with seepage may be put into characteristic form and solved numerically in finite steps along the irregular network formed by the characteristic lines using a simple predictor-corrector scheme. Infiltration into the soil is assumed to depend solely upon contact time between water and soil. In regions of substantial curvature of the characteristic lines, step size is reduced to preserve accuracy. Near the very front of the advancing stream, where the forward and backward characteristics curve extremely sharply and merge with their envelope, the wave-front trajectory, the numerical approximations to the characteristic equations break down and are replaced by the assumption that water velocity is independent of the distance coordinate and equals front-propagation speed.
(Knapp-USGS)
W74-08384

SEDIMENT ROUTING IN IRRIGATION CANAL SYSTEMS.

Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 2J. W74-08385

FLOW CHARACTERISTICS OF SLOPING CHANNEL JUMPS, Alberta Univ., Edmonton. Dept. of Civil Engineer-

ing. N. Rajaratnam, and V. Murahari.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY6, Paper 10594, p 731-740, June 1974. 9 fig, 1 tab, 16 ref, append.

Descriptors: *Hydraulic jump, *Model studies, Shear stress, *Open channel flow, Shear stress, *Open channel flow, Drops(Structures), *Supercritical flow, Critical flow. Turbulent flow.

The mean flow characteristics of hydraulic jumps were studied in sloping rectangular channels with slopes of 2%-25%. The supercritical Froude number was the range of 5 to approx 8. It was found that the mean velocity profiles could be analyzed using the theoretical model of plane turbulent wall jets. The bed shear stresses are com paratively larger than in the corresponding level channel jumps. (Knapp-USGS)

MECHANISM FOR STREAMFLOW MEANDER-

British Columbia Univ., Vancouver, Dept. of Civil Engineering. M. C. Ouick

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY6, Paper 10587, p 741-753, June 1974. 6 fig, 10 ref. ap-

Descriptors: *Meanders, *Sediment transport, *Vortices, *Channel morphology, Turbulent flow, *Open channel flow, Alluvial channels, Sedimen-

Meandering is explained in terms of the fluid mechanics of vortex flow and entrainment of the movable boundary. The bed material and the surrounding geology permit or prohibit this meander mechanism and have a major reactive role so that some meander parameters are largely a function of bed material characteristics. The existence of such a fluid mechanics mechanism explains why meanders are observed not only in erodible bed rivers but also in flow across ice, in the motion of some ocean currents, and perhaps in the atmospheric flows such as the jet stream, where entrainment of the surrounding fluid replaces the entrainment of silt. The angular deflection of the stream is given by the ratio of stream wise vortex strength to free stream velocity, a ratio which should be independent of river size. Sediment transport rate is very much a function of meander shape which in turn causes the production of streamwise vorticity. The sediment transport equations now in use are based on uniform mean velocities and resulting tractive stresses. The mechanisms suggested in this paper that the same mean velocity may produce very different sediment transport rates depending on the degree of development of the meander pattern. Meanders are the result of flows which exist for long periods of time and characteristically are highly organized products of long duration events. Floods, on the other hand, are short-duration highenergy events which try to superimpose a new pattern. These superimposed new patterns result in cutoffs and a disorganization of the meander pattern which is slowly corrected during the ensuing periods of flow. (Knapp-USGS) W74-08388

TRANSVERSE DISPERSION IN OCILLATORY CHANNEL FLOW, British Columbis Univ., Vancouver, Dept. of Civil

Engineering. For primary bibliographic entry see Field 5B. W74-08389

ENHANCED DISPERSION IN DRAG REDUC-ING OPEN CHANNEL FLOW. Clemson Univ., S.C. Dept. of Chemical Engineer-

For primary bibliographic entry see Field 5B. W74-08390

OBSERVATIONS ON HYDRAULIC JUMPS AT ROUNDED STEP, Memorial Univ. of Newfoundland, St. Johns,

Dept. of Engineering and Applied Science.

J.J. Sharp. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY6, Paper 10592, p 787-795, June 1974. 7 fig. 4 ref, ap-

Descriptors: *Hydraulic *Drops(Structures), Critical flow, Turbulent flow, Vortices, Open channel flow, Waves(Water). Tailwater.

The formation of a hydraulic jump at an abrupt step was compared to that at a step with rounded edge. The large standing wave associated with the abrupt step does not form when the step is rounded, and downstream waves can be suppressed. The range of tailwater depths over which the jump is located at the step shows only slight dissimilarities with similar measurements taken at abrupt steps. There is little difference in maximum hed velocities, but reversal of hed flow does not occur downstream of the rounded step. (Knapp-USGS) W74-08391

TO ESTABLISH VIABLE METHODS OF MAIN-TAINING WASTE TREATMENT FACILITY EF-FICIENCIES WITH REFERENCE TO FLOW VARIATIONS

Maclaren (James F.) Ltd., Willowdale (Ontario). For primary bibliographic entry see Field 5D. W74-08398

OUTLET WORKS, WARM SPRINGS DAM, DRY CREEK, RUSSIAN RIVER BASIN, SONOMA COUNTY, CALIFORNIA,

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 8A. W74-08584

SELECTIVE WITHDRAWAL FROM MAN-MADE LAKES,

Army Engineer Waterways Experiment Station. Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 4A. W74-08585

GALVESTON BAY HURRICANE SURGE STUDY: REPORT 1. EFFECTS OF PROPOSED BARRIERS ON HURRICANE SURGE HEIGHTS--APPENDIX CALIBRATION A, TESTS.

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. R. A. Sager, and E. C. McNair, Jr.

Available from NTIS, Springfield, Va 22151 as AD-759 119, price \$3.00 printed copy; \$1.45 in microfiche. Army Engineer Waterways Experiment Station Technical Report H-69-12, March 1973, 21 plate, 7 photo, 8 tab.

Descriptors: *Hydraulic models, *Bays, *Flood protection, *Surges, *Hurricane, *Texas, Waves(Water), Model studies, Coastal engineer-Identifiers: *Galveston Bay(Tex).

The effectiveness of possible hurricane protection systems for the Galveston Bay, Texas, complex, was tested using hydraulic models. Results of tests to define head losses associated with key portions of the complex are presented to serve as input to a mathematical model of the Galveston Bay area Tests defined the head losses for normal tides and hurricane surge conditions for the Galveston Harbor Entrance and the barrier beaches associated with Galveston Bay. Model structures allow the effectiveness of two barrier plans (Alpha and Gamma) to be evaluated in a distorted-scale model (1:100 vertically and 1:3000 horizontally). Model structures of a 400-ft-wide by -55 ft msl navigation opening for each plan and a gated opening with the top of the gate at +5 ft msl were developed.
(Knapp-USGS) W74-08586

Field 8—ENGINEERING WORKS

Group 8C-Hydraulic Machinery

8C. Hydraulic Machinery

DEFINITION OF REVERSE OSMOSIS PUMP REQUIREMENTS FOR SPACE REQUIREMENTS. VEHICLE

McDonnell Douglas Astrona Huntington Beach, Calif. M. S. Bonura, and G. W. Wells. Astronautics Co., West,

M. S. Bonura, and G. W. Wells. Available from the National Technical Informa-tion Service as PB-223 745; \$10.75 in paper copy, \$1.45 in microfiche. Office of Saline Water, Re-port INT-OSW-RDPR-73-892. June 1973, 174 p, 45 fig, 13 tab, 11 ref. OSW Contract 14-30-3062.

Descriptors: *Reverse osmosis, *Pumps, *Pump testings, Centrifugal pumps, *Pumping, Costs. Identifiers: Reciprocating pumps, Gear pumps, Vane pumps, *Reverse osmosis pumps, Flight specifications, Pump design, Pump per-

This report covers the investigation of high-pressure reverse osmosis (RO) pumps for space vehicle application. The vendor pump survey and pump evaluation tasks are described. Four selected RO pumps were ordered and evaluated during a 30-day test under spacecraft wash water recovery system conditions. Of the four candidate pumps, only two successfully completed the required 30 days (720 hours) of operation. A description of the test stand and the data from the pump evaluation test are included. The test data include pump power requirements, efficiency and other design parameters. The test data were used to develop recommendations for a flight-type prototype RO pump and a design specification for a high-pressure RO pump for space vehicle application. Also included are rough order of magnitude (ROM) costs for the development of a flight type RO pump. (OSW) W74-08340

DESIGN AND CONSTRUCTION OF A LARGE WATER DESALINATION MODULE,

Dow Chemical Co., Walnut Creek, Calif. For primary bibliographic entry see Field 3A. W74-08343

8D. Soil Mechanics

OPERATION AND MAINTENANCE OF NEW BEDFORD HURRICANE BARRIER (FINAL EN-VIRONMENTAL STATEMENT).

New England Div. Corps of Engineers, Waltham,

Available from the National Technical Informa-tion Service as EIS-MA-73-1353-F, \$4.00 in paper copy, \$1.45 in microfiche. September 1972. 23 p, 3 map, I chart, 7 append.

Descriptors: *Harbors, *Massachusetts, *Dikes, *Barriers, *Flood protection, *Hurricanes, Shore protection, Boats, Engineering structures, Intake gates, Slide gates, Environmental effects, Flooding, Flood control, Cost-benefit analysis, Decision making, Water pollution sources, Pumping, Boating, Swimming, Recreation, Social needs, Beaches, Boat-launching ramps, Levees, Earth dams, Earthworks. Identifiers: *Environmental impact statement,

New Bedford(Conn), Buzzards Bay, Coastal waters.

The beneficial environmental impacts of the New Bedford hurricane barrier will be to provide protection for commercial, industrial, and residential areas from tidal flooding during major coastal storms and hurricanes. It will also serve as a protective facility for harbor-based and transient ves-sels. The adverse environmental effects include rodent control and air jetting which causes temporary turbidity. The only alternatives to the project are to discontinue the operation or maintenance of

particular feature or to discontinue the whole project. The harbor barrier and dike is 9,100 feet long. The barrier consists of an earth and rock fill section with stone armor protection. The barier has two navigation openings which can be closed during storms. The environmental impact statement includes several maps which show the barrier and its constitutent parts, includning navigation gates, conduit gates, intake gates, sewer gates, street gates, and pumping stations. Harvesting of marine gates, and pumping stations. Flarvesting of marine resources in the harbor area is virtually non-existent due to gross water pollution. The barrier provides recreation in the form of two boat launching ramps and two public beaches. (Sperling-Florida) W74-08520

ENVIRONMENTAL. STATEMENT.

FINAL ENVIRONMENTAL STATEMENT, WEST TERRE HAUTE LEVEE, WABASH RIVER, INDIANA, WABASH RIVER BASIN. Corps of Engineers, Louisville, Ky. Available from the National Technical Informa-tion Service as EIS-IN-73-1666-F, \$3.75 in paper copy, \$1.45 in microfiche. February 23, 1973. 28 p,

Descriptors: *Flood protection, *Flood damage, *Levees, Watershed management, Flood control, *Indiana, Environmental effects, Non-structural alternatives, Flood routing, Federal government, Local governments, Legislation, Cost-benefit analysis, Project planning, Floodways, Retaining walls, Levees, Earthworks, Flood plain zoning. Identifiers: *Environmental impact statement, Terre Haute(Ind).

This proposed work will provide local flood protection for the West Terre Haute, Indiana area. The project is an urban levee that will consist of constructing an earth levee, a concrete wall, a rail-road fill slope blanket, a raised street, one pumping plant and other necessary appurtenances. The land required totals about 60 acres and about 440 acres are protected by the levee against floods having an average recurrent frequency of once in each 100-year period. Construction of the levee and floodwall was 99% complete as of January 1973 and the overall project is about 90% completed. Approximately 60 acres of land is now removed from tax rolls, but these losses can be recouped in the project benefits which will accrue. Some landscape views will be blocked by the project and increased development in the protected area could be adverse if not controlled. Alternatives considered included alternate alignments, nonstructural methods of flood damage reduction and flood proofing. (Sutton-Florida) W74-08660

8G. Materials

DEVELOPMENT OF PRODUCTION TECHNIQUE FOR POROUS STAINLESS STEEL TUBES, Universal Oil Products Co., Dearborn Heights,

Mich. Wolverine Tube Div. T. J. Allen.

Available from the National Technical Informa-tion Service as PB-229 729/AS, \$6.75 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-74-928, March 1974. 67 p, 24 fig, 12 tab. OSW Contract 14-30-2843.

Descriptors: *Desalination, *Reverse osmosis, *Membranes processes, Pilot plants, *Tubes, *Corrosion.

Identifiers: Membrane supports, Corrosion evaluation, Cost estimates, Porous tubes, *Steel

A summary is presented of work performed in developing a production process for seamless porous stainless steel tubing as used for membrane supports in reverse osmosis systems. A process for compacting stainless steel powder in an annular mild steel shell was developed. A prototype quantity of tubing was fabricated to demonstrate process reproducibility and to provide samples for product characterization and evaluation of corrosion resistance. A manufacturing cost estimate was prepared for large scale production of the product. Seamless porous stainless steel tubing is fabricated by loading stainless steel powder into an annular mild steel shell, compacting the powder using a combination of tube drawing and tube reducing, sintering the compacted composite, and chemically removing the mild steel shell. The process as developed yields a product having good dimensional tolerances, burst strengths exceeding 4000 psi, pore sizes in the range 2-6 microns, and permeabilities in excess of 100 GSFD at 50 psi. The product appears to exhibit good corrosion resistance under reverse osmosis desalination conditions. It is estimated that the product would cost \$1.85/foot (or approximately \$14/ft sq) in quantities in the range of one-five million feet of 0.50 in. interior diameter tubing per year. (OSW)

81. Fisheries Engineering

OPTIMUM ESCAPEMENT STUDIES OF CHIG-NIK SOCKEYE SALMON,
Washington Univ., Seattle. Fisheries Research

W. H. Parr, Jr., and R. L. Burgner

Available from NTIS, Springfield, Va. 22151 as COM-73-11179, Price \$3.00 printed copy; \$1.45 microfiche. Completion Report for July 1969 to June 1970 to National Marine Fisheries Service, November 1970, 17 p, 4 fig, 6 tab, 10 ref.

Descriptors: *Salmon, *Alaska, *Fisheries, *Fish diets, Food chains, Juveniles, Fish populations, Fish hatcheries, Predation, *Sockeye salmon. Identifiers: Coho salmon.

Studies were directed primarily toward gaining an understanding of the interactions affecting sockeye salmon production in the lake nursery affecting Beach seining, surface trawling and echo sounding were conducted for determination of the growth, abundance, distribution, and mortality rate of juvenile sockeye salmon and associated species. The study of food supply and food habits of the juvenile sockeve salmon and resident fishes was continued for a third year so that competition between species under different population densities could be determined. Efforts were made to further understand the effects of predation by Dolly Varden and coho salmon on juvenile sockeye salmon. Assistance was given to the Alaska Department of Fish and Game in collec-tions of statistics on the adult salmon runs. Methods used to forecast the magnitude and age composition of the 1970 run were evaluated. (Knapp-USGS) W74-08176

GENERALIZATION OF SPAWNING AND REARING DISCHARGES FOR SEVERAL PACIFIC SALMON SPECIES IN WESTERN WASHINGTON,

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 2I.

1971 PUGET SOUND FALL CHINOOK SAL-MON TAGGING STUDY, Washington State Dept. of Fisheries, Olympia.

Management and Research Div. G. I. Fiscus, and E. D. Jewell.

O. I. Fiscus, and E. D. Jewell.
Available from NTIS, Springfield, Va. 22151 as
COM-73-11593 Price \$5.00 printed copy; \$1.45
microfiche. Washington State Department of
Fisheries Contract Report to NOAA, National
Marine Fisheries Service, March 1973. 52 p. 12 fig.
13 tab, 6 ref. NOAA Contract N208-0054-72(N).

Secondary Publication And Distribution—Group 10C

Descriptors: Descriptors: *Salmon, *Chinook salmon, *Commercial fish, Fish management, Fish migrasalmon.

Fall Chinook Salmon were tagged in marine waters of inner Puget Sound between Discovery Bay and Seattle from July 18 to August 13, 1971. A total of 200 tags (42.1% of the number released) were recovered or sighted and of these, 90 tags (45.0% of the number recovered) came directly from hatchery trapping facilities. Nine specific stocks in the tagging areas were partially determined. The absence of tag recoveries outside of Puget Sound waters indicated fall chinook stocks to be entirely of Puget Sound origin. Three watersheds con-tributed a major portion of the total chinook population. These were Hood Canal, Lake Washington, and the Duwamish-Green River stocks. (Knapp-W74-08452

MARINE FISHERIES.

For primary bibliographic entry see Field 6E. W74-08574

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

NINTH ANNUAL REPORT. FISCAL YEAR

Auburn Univ., Ala. Water Resources Research

For primary bibliographic entry see Field 9D. W74-08232

9C. Research Facilities

ENVIRONMENTAL RESEARCH IN 1973--AN-NUAL REPORT.

National Environmental Research Center, Cincinnati Ohio

For primary bibliographic entry see Field 5G. W74-08309

9D. Grants, Contracts, and Research Act Allotments

NINTH ANNUAL REPORT, FISCAL YEAR

Auburn Univ., Ala. Water Resources Research Inst.

Available from the National Technical Information Service as PB-232 526 \$6.75 in paper copy, \$1.45 in microfiche. 1973. 65 p, 3 tab. OWRR A-999-AT A(2)

Descriptors: *Water resources research act, *Alabama, *Universities, Colleges, Water resources development, Water pollution, *Water Resources Institute, Training, Grants, Projects.

The Ninth Annual Report of Alabama's Water Resources Research Institute at Auburn University describes research and other activities underway during Fiscal Year 1973 (July 1, 1972 through June 30, 1973) and identifies the application of research results for the solution of water resources problems. Alabama's water problems chiefly are in areas of water quality management and protec-tion and water resources planning; these and closely related problem areas receive emphasis in the program of the Water Resources Research Institute. (Knapp-USGS) W74-08232

NATIONAL SEA GRANT COLLEGE AND PRO-GRAM--EXTENSION.

For primary bibliographic entry see Field 6E.

W74-08568

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

USER'S GUIDE TO NODC'S DATA SERVICES. National Oceanographic Data Center, Washington, D.C.

Available from Sup Doc GPO, Washington, D.C. 20402, Price \$1.00 domestic postpaid. Key to Oceanographic Records Documentation No 1, February 1973. 72 p, 17 append.

*Information Descriptors: exchange, *Documentation, *Oceanography, *Data collections, Hydrologic data, Data storage and retrieval. Identifiers: *Oceanographic data.

Key to Oceanographic Records Documentation No. 1, User's Guide to NODC's Data Services, February 1973, supersedes NODC Publication G-15, User's Guide for NODC's Data Processing Systems, 1969, of the former NODC General Series. The Guide is prepared to help users of NODC's services formulate requests for data and related information. It describes data bases and formats in which data can be obtained, contains examples of data listings, summaries, and displays, and explains entries and codes used in prin-tout formats. (Knapp-USGS) W74-08311

10B. Reference and Retrieval

USER'S GUIDE TO NODC'S DATA SERVICES. National Oceanographic Data Center, Washington, D.C.

For primary bibliographic entry see Field 10A. W74-08311

DIGEST OF THE 1972 CATALOG OF INFOR-MATION ON WATER DATA, Geological Survey, Reston, Va. Office of Water

Data Coordination. For primary bibliographic entry see Field 10D. W74-08600

10C. Secondary Publication **And Distribution**

PRELIMINARY SYSTEM DEVELOPMENT--CHEMICAL HAZARDS RESPONSE INFORMA-TION SYSTEM (CHRIS), APPENDIX VII--SUP-PORTING INFORMATION.

Little (Arthur D.) Inc., Cambridge, Mass. For primary bibliographic entry see Field 5B. W74-08181

BIBLIOGRAPHY ON THE POLLUTION ASPECTS OF COKE OVENS,

British Steel Corp., (Sheffield) (England). Strip Mills Div.

For primary bibliographic entry see Field 5B. W74-08183

A WORLDWIDE DIRECTORY OF STREAM

ECOLOGISTS, Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.

K. W. Cummins.

Available from the National Technical Information Service as PB-232 420 \$3.75 in paper copy, \$1.45 in microfiche. Michigan Institute of Water Research, E. Lansing, Technical Report No 28, February 1973. 67 p. OWRR B-019-MICH(3). Contract AT(11-1)-2002.

Descriptors: *Ecology, *Streams, *Personnel, Scientific personnel, Ecosystems, Aquatic habitats, Environment, Research and develop-

*Stream Identifiers: ecologists. *Directories(Personnel).

This directory lists workers actively engaged in stream research. The intent of the directory is to increase communication between individuals working on stream problems. (Knapp-USGS) W74-08235

ENVIRONMENTAL INFORMATION SOURCES -- ENGINEERING AND INDUSTRIAL APPLICA-TIONS: A SELECTED ANNOTATED BIBLIOG-RAPHY.

Massachusetts Inst. of Tech., Boston. James Madison Barker Engineering Library.

Special Libraries Association, New York, N.Y.,
1972. C. Schildhaver, compiler. 45 p.

Descriptors: *Bibliographies, *Reviews, *Documentation, *Publications, *Information exchange, *Data collections, *Environment, Environmental control, Pollution abatement, Ecology, Technical societies, Libraries. Identifiers: Directories.

This compilation was prepared for a continuing-education seminar held during the 63rd Annual Conference of SLA, June 4-8, 1972 in Boston. It lists and briefly describes various publications and agencies providing information on pollution and ecological problems. It includes abstracting-indexing and current-awareness services, bibliographies and catalogs, directories, yearbooks and guides, encyclopedias, dictionaries, atlases, handbooks encyclopedias, dictionaries, atlases, nanobooks and manuals, journals, newsletters, symposia and continuing serials, and miscellaneous information services. Addresses, prices, and scopes of each are indicated. (Brown-IPC) W74-08401

A GUIDE TO NATURAL RESOURCE INFOR-

MATION OF GEORGIA. Georgia Dept. of Natural Resources, Atlanta. 1973. 481 p, 14 fig.

Descriptors: *Natural resources, *Bibliographies, 'Information retrieval, 'Water resources, 'Georgia, Environment, 'Abstracts, Publications, Libraries, Technical writing, 'Land resources, Resource mix, Resources, Resources development, Resources allocation.

Identifiers: Annotated bibliography, resources

This annotated bibliography, compiled as the the first step of Georgia's plan to assess and manage its water, land, and air resources, contains 3080 entries and is designed to improve access to neces-sary documents for these needs. Entries are grouped by authorizing agency on local, state, regional, and federal levels and are assigned index numbers for easy access. An index tabulates selected subject fields for each county and for the state. Contacts for information, an information exchange, fee schedule, organizational boundary map, county location maps, and a listing of federal depository libraries in Georgia are given. The volume is useful to agencies desiring Georgia state environmental information, to planners, and to technicians. Technical terminology is avoided to facilitate general use. (Grden-North Carolina) W74-08487

WATER: A COMPREHENSIVE TREATISE. VOLUME 1. PHYSICS AND PHYSICAL CHEMISTRY OF WATER. For primary bibliographic entry see Field 1A. W74-08665

Field 10—SCIENTIFIC AND TECHNICAL INFORMATION

Group 10C—Secondary Publication And Distribution

WATER: A COMPREHENSIVE TREATISE. VOLUME 2. WATER IN CRYSTALLINE HYDRATES: AQUEOUS SOLUTIONS OF SIMPLE NONELECTROLYTES. For primary bibliographic entry see Field 1B. W74-08666

W74-08667

WATER: A COMPREHENSIVE TREATISE. VOLUME 3. AQUEOUS SOLUTIONS OF SIMPLE ELECTROLYTES.
For primary bibliographic entry see Field 1B. W74-08667

10D. Specialized Information Center Services

PRELIMINARY SYSTEM DEVELOPMENT--CHEMICAL HAZARDS RESPONSE INFORMA-TION SYSTEM (CHRIS), APPENDIX VII--SUP-PORTING INFORMATION. Little (Arthur D.) Inc., Cambridge, Mass. For primary bibliographic entry see Field 5B. W74-08181

DIGEST OF THE 1972 CATALOG OF INFORMATION ON WATER DATA, Geological Survey, Reston, Va. Office of Water Data Coordination. F. H. Pauszek. Available from NTIS, Springfield, Va. 22151, PB-232 080/AS Price \$4.00 printed copy; \$1.45 microfiche. Water-Resources Investigations 63-73, December 1973. 83 p, 20 fig, 22 tab.

Descriptors: *Data collections, *Information exchange, *Hydrologic data, *Documentation, Projects, Surface waters, Water quality, Groundwater, Gaging stations, *Information retrieval. Identifiers: *Catalog on Information on Water Data.

The Catalog of Information on Water Data is a file of information about water-data acquisition activities. The 1972 edition of the Catalog consists of 21 separate volumes, one for each of the water resources regions. Each volume contains information on water-data acquisition activities conducted by Federal and non-Federal agencies on stage and flow of surface waters and springs, and water quality of surface waters and springs, and water 1972 edition of the Catalog. Items covered are: Who is reporting, what is reported, what is the scope of activities, and what are the periods of record. It also includes information on active groundwater stations reported in the 1968 edition of the Catalog and areal investigations and miscellaneous water-data activities reported in the 1970 edition. (Knapp-USGS) W74-08600

10F. Preparation Of Reviews

WATER: A COMPREHENSIVE TREATISE. VOLUME 1. PHYSICS AND PHYSICAL CHEMISTRY OF WATER. For primary bibliographic entry see Field 01A. W74-08665

WATER: A COMPREHENSIVE TREATISE. VOLUME 2. WATER IN CRYSTALLINE HYDRATES: AQUEOUS SOLUTIONS OF SIMPLE NONELECTROLYTES. For primary bibliographic entry see Field 01B. W74-0866

WATER: A COMPREHENSIVE TREATISE. VOLUME 3. AQUEOUS SOLUTIONS OF SIM-PLE ELECTROLYTES.

For primary bibliographic entry see Field 01B.

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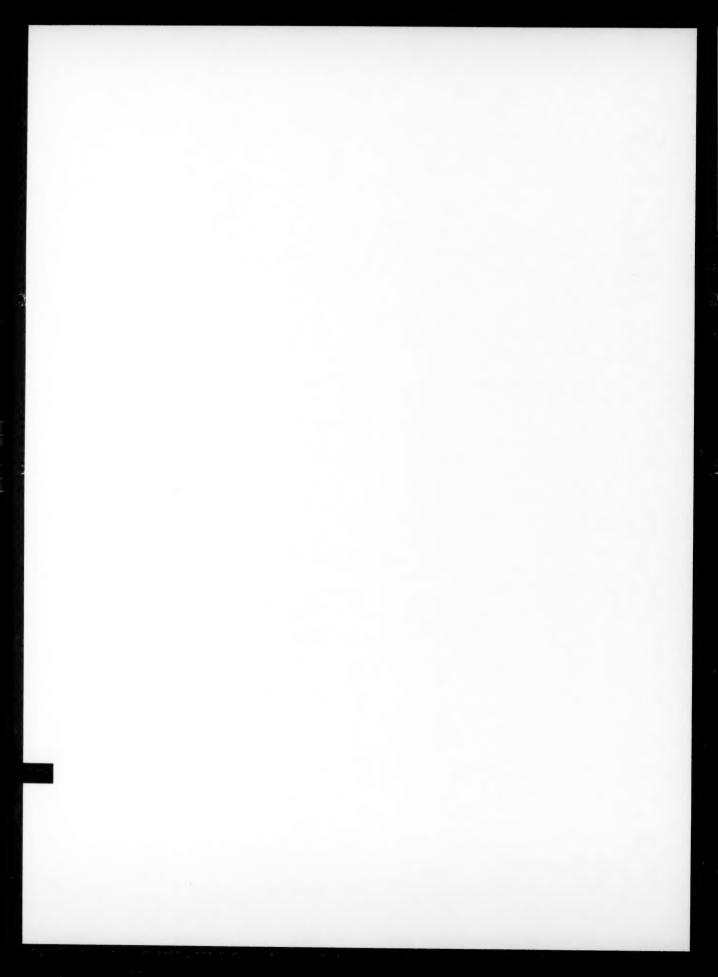
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- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
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